Bipartisan Policy Center

January 2024

Kickstart Markets for Clean Energy Technologies

A NEWBIE'S GUIDE TO DEMAND-SIDE SUPPORT

By John Jacobs, Tanya Das, Xan Fishman, Danny Broberg

January 2024

Do you want to kickstart markets for clean energy technologies, but investors are concerned there won't be enough customers at a worthwhile price? Demand-side support might do the trick to calm fears and crowd-in needed private investment.

Simply put, companies need to have confidence that there will be customers for their product at a price that delivers an adequate return on investment to secure financing. Without some certainty that there is a viable market, private lenders will deem these investments too risky. Demand-side support can provide needed confidence, and as a result, "de-risk" projects.

As governments look to accelerate the commercialization of various clean energy alternatives, more attention is being paid to the demand-side of the equation—i.e., making sure clean technologies actually find customers. Numerous countries are adopting pioneering initiatives,[1] private companies are investing collaboratively to establish novel organizations,[2] and the Department of Energy (DOE) is exploring[3] ways to provide demand-side support, most recently for clean hydrogen.[4]

But what exactly is "demand-side support" and how does it work? This guide offers a comprehensive overview of different demand-side support tools, describing typical applications and providing real-world examples of how specific tools can be utilized. Importantly, this guide does not endorse any specific tool or the general use of demand-side support. Each use case and each market are unique, and different considerations will apply as a result.

Table of Contents

Defining Demand-Side Support

First and foremost, it is essential to clarify what this guide is not about: increasing the supply of clean energy technologies. Historically, policymakers have often focused on incentivizing the development of or investment in new technologies. Examples include grants for research and development, investment and production tax credits for renewable energy, and support for specific product manufacturing.

However, these policies are generally not designed to ensure that clean energy technologies find customers at a price that provides technology developers and investors with an adequate return on investment. Successfully deploying the next generation of clean energy technologies requires significant private sector investment magnitudes larger than what the government can or should spend. Therefore, government incentives need to be directed at increasing private lender confidence that they will receive an adequate return if they step up to the plate and invest in clean energy technologies.

Enter Demand-Side Support

A range of strategies can be used to ensure both adequate demand and a viable price for specific products. This, in turn, motivates investors to back companies that can initiate production or implement projects. In effect, demand-side support mitigates concerns about return on investment and serves to "de-risk" projects.

WHY IS DEMAND-SIDE SUPPORT IMPORTANT?

There are many reasons to promote increased demand for a specific product or type of product. These reasons often overlap with each other, but they broadly include:

1. Innovation and Commercialization: Figuring out how to produce a new and innovative product is often expensive and risky. In addition, it is difficult for companies and investors to gauge how much demand there will be for a product that has not been commercialized or has yet to be created. Demand-side support can give companies and investors confidence that if they figure out how to deliver a new product, they will see a worthwhile return on investment.

2. Market Certainty: Some markets are characterized by price volatility, which increases risk and uncertainty for investors. Price stability, a result of some forms of demand support, provides investors with greater certainty that they will receive a worthwhile return on their investment, thereby increasing and stabilizing investment in the market and improving product reliability and affordability.
3. Societal Benefit: Clean energy technologies may provide societal benefits that are not adequately reflected in their price, including improving air quality, emissions reductions, and bolstering national security. Demand-side support policies aim to address the underproduction of these technologies by guaranteeing a customer base and/or market price. The goal is to help ensure that future production of these technologies aligns with their actual societal value.
4. Supply Chain Security: Governments may use demand support tools to secure supply chains for commodities that are important for national security. Companies may also utilize demand-side support to establish the supply chains they require for producing clean energy technologies. This can help alleviate supply chain vulnerabilities associated with relying on foreign competitors for components and ensure a certain level of self-sufficiency, even if in-house production or reliance on other domestic sources is initially more costly.

WHEN DOES DEMAND-SIDE SUPPORT HELP?

Demand-side support addresses two specific risks that companies that have innovative technology or are in volatile markets often face:

- Volume Risk: The risk that demand for a product (or service) will not be sufficient to support its production. This risk is prevalent in markets for common products with unpredictable or volatile demand, as companies struggle to accurately forecast purchasing behavior. Volume risk is also problematic for new and innovative products because customers are unfamiliar with the product, are uncertain about how it fits with their existing lifestyle or operations, may need to incur the cost of adapting their operations to utilize the product, and might be worried that the product will not perform as advertised.

- Price Risk: The risk that a product (or service) will not command a price that is sufficient to justify production. This risk is prevalent for new and innovative products and for common products where the market is highly volatile and subject to significant price swings. It is often difficult for companies to gauge both the number of potential customers for a new and innovative product, and the price those customers will be willing to pay, especially if there is an existing and cheaper alternative. Price risk can make companies uncertain that they will receive reasonable return on investment once their product gets to market, often leading to the company not investing in production at all.

While these risks are intertwined—lower prices lead to greater demand and thereby reduce volume risk—they're also worth considering individually. Volume risk may persist even when a product is price competitive because potential customers may worry that new companies will fail to deliver. Some customers won't want to incur the cost and hassle of adapting their operations to utilize the product. Likewise, even if there is an established base of customers to mitigate volume risk, price risk may persist because of unexpected market volatility.

This guide considers both demand-side support tools that mitigate volume risk by directly providing customers for a new product, as well as tools that mitigate price risk by directly guaranteeing that a product will sell for a price that justifies investment.

WHO WOULD WANT TO SPUR DEMAND?

Different entities will want to spur demand for different reasons. Companies and governments might be hungry for a competitive advantage. Governments, in particular, often strive to ensure a dependable and affordable supply of essential commodities regardless of unpredictable market conditions. Meanwhile, non-profits and governments may recognize the often-overlooked societal benefits of specific products and seek to ramp up their production for the greater good. Additionally, companies and governments may be concerned about relying on competitors for crucial resources—a vulnerability they may want to overcome by establishing self-reliance.

But, for the purposes of this document, we need a guide—a heroic figure who embodies all these entities and the spirit of demand-side support.

Enter ***Captain Demand***, the embodiment of all entities, whether public or private, that seek to harness the power of demand-side support. Often, Captain Demand will be a government, but private organizations, such as foundations, non-profits, or even companies interested in promoting climate-friendly innovation, may be a source of demand-side support. Regardless of the entity behind this support, Captain Demand's mission is the same: to deliver effective tools for overcoming the risks that might otherwise deter companies from investing in innovative low-carbon products.

Companies gain Visor against Volume Risk (helmet) when the support alleviates volume risk.

Companies gain Protector from Price Risk (shield) when the support alleviates price risk.

With Captain Demand at the helm, companies can chart a course to commercial success!

Captain Demand's Arsenal: Unlocking the Toolbox

Before we dive in, let's address a necessary clarification: the tools listed in this guide are not mutually exclusive. In fact, some tools may interact or give rise to the use of other tools. Rather than standing alone, each tool introduces a new element that enhances effectiveness in specific situations.

Additionally, these tools are just a beginning. Each can be molded and built upon to fit unique markets and scenarios. This guide provides an introduction to the toolbox and describes what each tool is best fit to accomplish but it is not intended to prescribe how these tools can or should work in all cases.

With this understanding in mind, it's time to delve into the mechanics of each tool and uncover the outcomes they can achieve.

DIRECT PROCUREMENT

What is it?

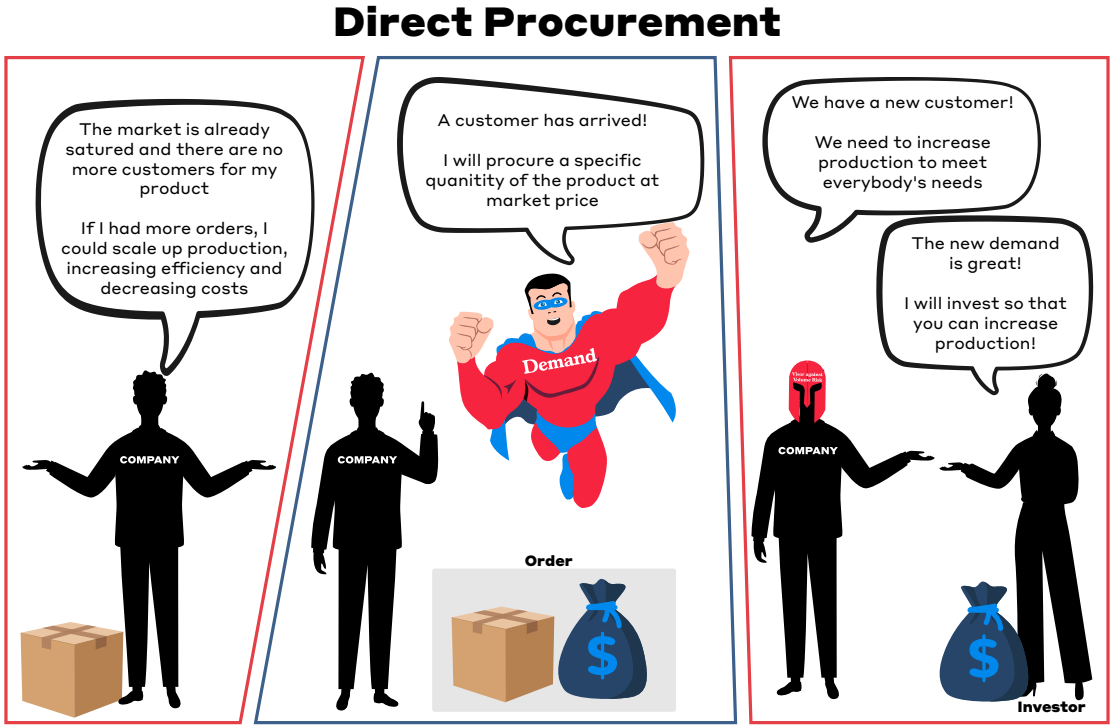
Using this tool, Captain Demand simply commits to purchase a specified quantity of a product at the market price, therefore directly increasing demand for that product. In other words, Captain Demand becomes a regular customer and, like a regular customer, seeks the lowest price available. However, the

complexity of finding the lowest price available depends on the product being procured. If the product is a widely traded commodity like crude oil, Captain Demand can simply purchase at the market or "spot" price,[5] knowing that this price represents a fair deal. If the product is not common and if a fair price for the product is difficult to assess, Captain Demand can use a competitive bidding system or even a reverse auction,[6] in which companies bid against each other to provide a given volume of product at a pre-agreed price, to win Captain Demand's business.

Once a supplier is selected, Captain Demand and the supplier enter into a bilateral agreement that specifies price, quantity, and delivery date. Upon delivery, Captain Demand owns the product. If Captain Demand does not have an immediate use for the product, they'd need to find a way to transport and store it for future use.

How does it help?

Direct procurement guarantees companies another customer, justifying increased production of the clean energy technology. Investors, noticing a reduction in volume risk, will be more willing to provide financial backing for the new equipment, facilities, or workers needed to meet demand for the product. Increased production can enable learning-by-doing, as companies figure out how to make their operations more efficient and increase returns on their capital investment. However, direct procurement does not necessarily mitigate price risk because Captain Demand seeks the lowest price available. If that price is too low to sustain production, direct procurement is likely not a solution.



What's an example of direct procurement?

In 2022, the U.S. government awarded $236 million[7] in federal contracts to directly procure rechargeable batteries. In one instance, the Army Corps of Engineers announced[8] plans to procure a 100-kilowatt-hour (kWh) battery energy storage system (BESS) from a single company. The winning contract was selected on the basis of a competitive process in which potential BESS suppliers were invited to submit proposals. In this way, the Army Corps of Engineers acquired a needed device while also supporting investment in expanding domestic production capacity for a critical new energy technology.

PROCUREMENT STANDARD

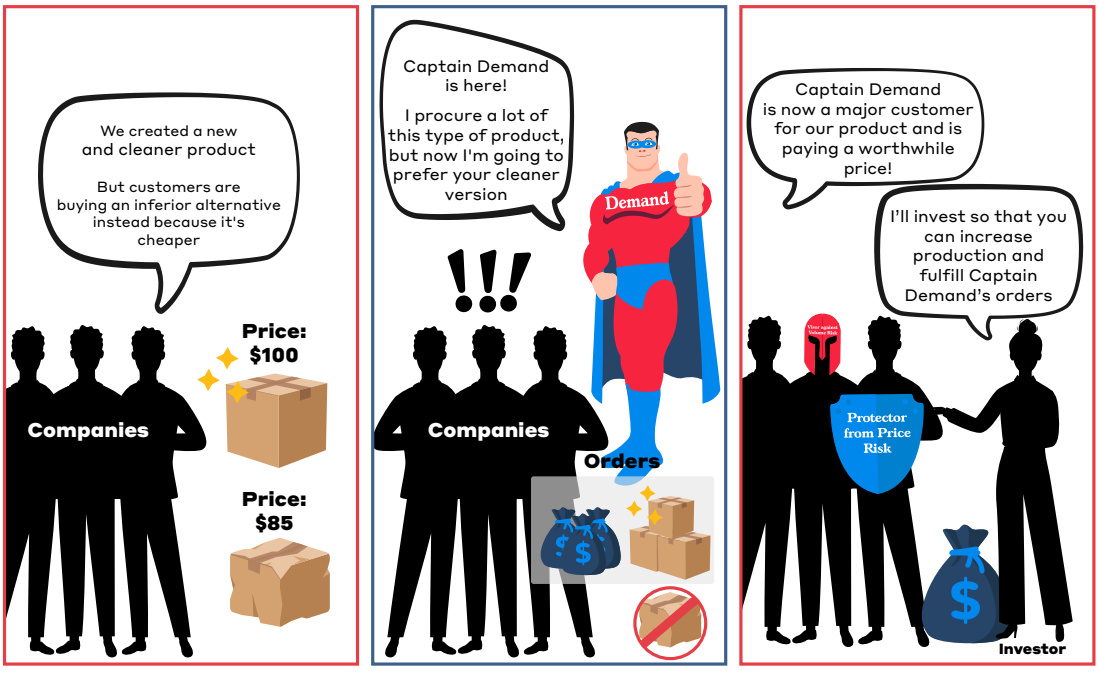
What is it?

A procurement standard allows Captain Demand to prioritize specific types of products or features when conducting direct procurement. Typically, such standards involves a superior, but also more expensive, version of a product that Captain Demand is already procuring. Procurement standards can enable Captain Demand to prioritize cleaner products, even if those products are more expensive. For example, a procurement standard for concrete could require a certain maximum level of emissions intensity.

How does it help?

A procurement standard signals to companies that they can command a price premium for products that meet more demanding performance or production criteria. Knowing that there will be customers for a cleaner version of an existing product, even at a higher price, reduces both volume and price risk, creating incentives for companies to invest in developing the production capacity to deliver these products.

Procurement Standard



What is an example of a procurement standard?

The Department of Agriculture's (USDA's) BioPreferred Program[9] sets a procurement standard for biobased products purchased by federal agencies as alternatives to petroleum-based products, including cleaners, paints, and lubricants. Biobased products are often more environmentally friendly, and the industry for making these products already supports more than 4 million jobs in the United States. Because some of these products are relatively new to the market, and because their environmental benefits are not reflected in the price, customers often stick with conventional, petroleum-based products. The goal of the BioPreferred Program is to leverage government demand to expand the market for biobased products, thereby incentivizing investments in development and production that will eventually allow these products to become cost-competitive with their petroleum-based alternatives.

MARKET STANDARD

What is it?

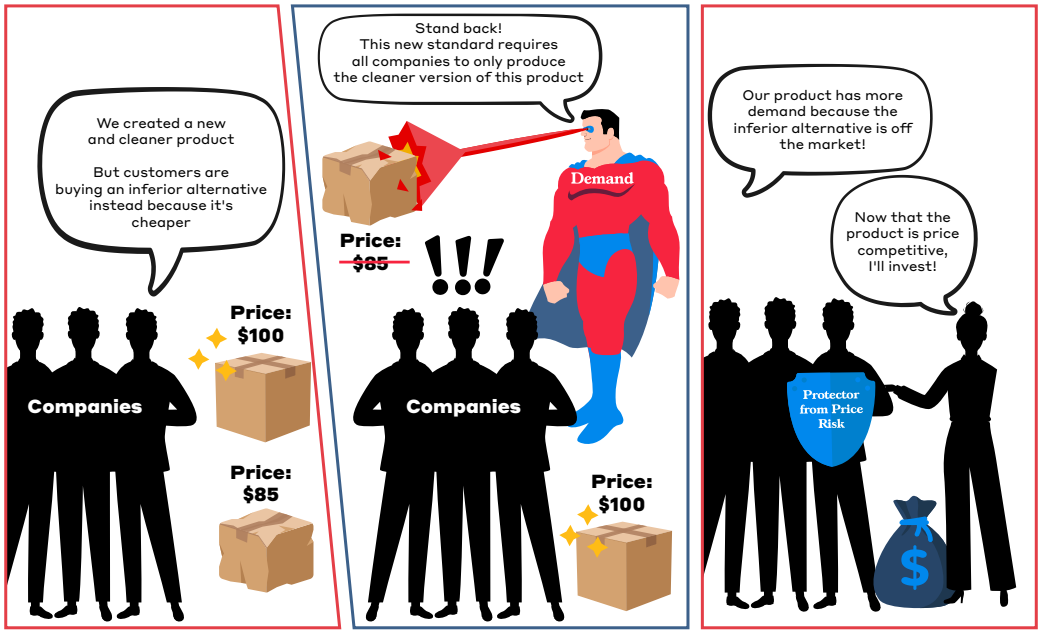
Governments can set market standards to require that specific products meet certain criteria to be sold. Such standards are commonly used to ensure that products are safe and reliable and perform as intended. But standards can also be used to ensure that products are cleaner by meeting minimum criteria with respect to energy efficiency or pollutant emissions. As the market transitions to demand cleaner products, successful companies will make the investments needed to deliver those products at the lowest possible price.

An essential aspect of market standards is that they necessarily impact *all* companies that make the products to which the standard applies. By contrast, direct procurement and other tools may target demand-side support to individual companies.

How does it help?

Because market standards incentivize all companies that make a specific product to invest in developing and producing a cleaner version, they impact the industry as a whole. Companies don't need to worry that their cleaner product will be undercut by a cheaper but inferior alternative. Investors, knowing that demand for the previous version of the product will mostly transfer to demand for the cleaner product, may see an opportunity for companies to gain market share if they can figure out how to produce the best and cheapest version of the product that also meets the new standards.

Market Standard



What is an example of a market standard?

DOE sets energy efficiency standards for a variety of common consumer appliances—including appliances for heating, cooling, refrigeration, cooking, clothes washing, and lighting—through its Appliance and Equipment Standards Program.[10] These standards compel all appliance manufacturers to create more energy-efficient products, which may come with higher upfront costs but typically result in lower overall costs for the life of the appliance. Without these standards, companies might hesitate to invest in making pricier yet cleaner appliances due to the potential for competition from cheaper but less efficient alternatives. Since its inception in 2009, the Appliance and Equipment Standards Program has generated more than $540 billion in estimated savings to U.S. consumers in the form of reduced energy bills through 2030.

CONSUMER TAX CREDIT

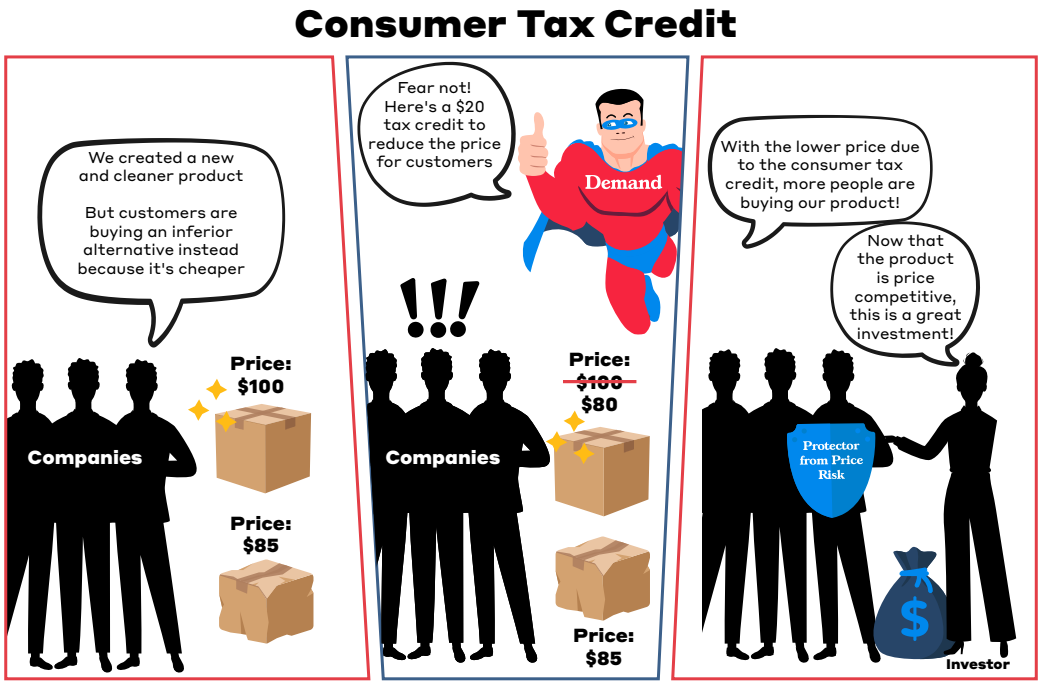
What is it?

Consumer tax credits are perhaps the most familiar of all the tools in Captain Demand's toolbox. A consumer tax credit, either in the form of a rebate or credit at the point of sale, reduces the price of a product by a specified amount, making it more attractive to buyers. While Captain Demand may require that products meet specific requirements to be eligible for a tax credit, all companies in the business of making products that can meet these requirements will benefit from the tax credit.

While all the other tools listed in this guide involve interactions between Captain Demand and the companies that make products, consumer tax credits are unique because they directly subsidize the customers who buy products.

How does it help?

Consumer tax credits address the risk that a cleaner product will be too expensive to attract enough customers to justify investments in making that product. Additionally, if cheaper but inferior alternatives are undercutting a cleaner version of the product, consumer tax credits can level the playing field. This tool is especially useful for reducing the "green premium" often associated with more sustainable products, making them cost-competitive with their less sustainable but cheaper alternatives. Once a cleaner product is cost-competitive, companies will be incentivized to increase production to meet increased demand.



What's an example of a consumer tax credit?

The Inflation Reduction Act introduced[11] a range of consumer tax credits aimed at increasing demand for existing energy-efficient technologies. For example, it provides a 30% credit for the purchase of a heat pump, which can both cool and heat a house more efficiently than a conventional air conditioner and furnace. However, heat pumps are often more expensive[12] upfront than the less efficient alternatives. The 30% consumer tax credit helps make this technology cost-competitive for customers, which in turn should give companies and investors the confidence to invest in expanding heat pump production and further developing heat pump technology.

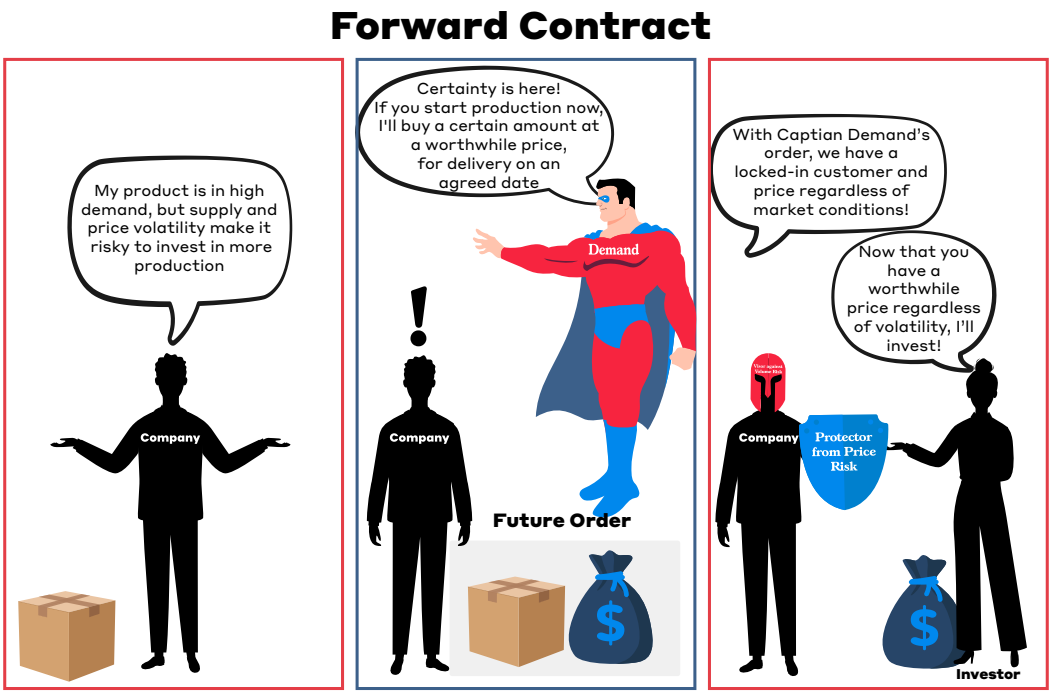
FORWARD CONTRACT

What is it?

A forward contract is a version of procurement where Captain Demand arranges to purchase a specified quantity of a product at an agreed-upon price, but delivery of the product is set for a date in the future. Once that date arrives, Captain Demand is obligated to procure the specified quantity of product at the agreed-upon price. Forward contracts are often used to lock in the price of a product where an established market exists but the product is subject to price volatility. This tool allows both the supplier and the customer to lock in the transaction ahead of time and ignore market price volatility in the interim.

How does it help?

While forward contracts mitigate both volume and price risk, they are primarily used to manage price risk. A forward contract ensures that if a company invests in production now, they can sell their product to Captain Demand at the predetermined price regardless of market conditions. Locking in a price can be especially valuable for products that require long lead times[13] before they can be delivered, which increases their exposure to price changes that could make current investments unprofitable. Forward contracts can also protect the purchaser in the event of future price increases.



What's an example of a forward contract?

Despite high crude oil prices in 2022, many companies were hesitant to invest in increasing their production capacity because of the risk that prices could fall to unprofitable levels by the time their oil reached the market. Global oil markets are unpredictable and subject to boom-and-bust cycles that can leave investors in the red. To incentivize investments in oil production, DOE finalized a rule[14] to allow it to purchase crude oil for the Strategic Petroleum Reserve through forward, fixed-price contracts, allowing producers with these contracts to ignore market price volatility between investment and delivery. Following a pilot program, DOE has successfully executed these contracts using this authority.

OFFTAKE AGREEMENT

What is it?

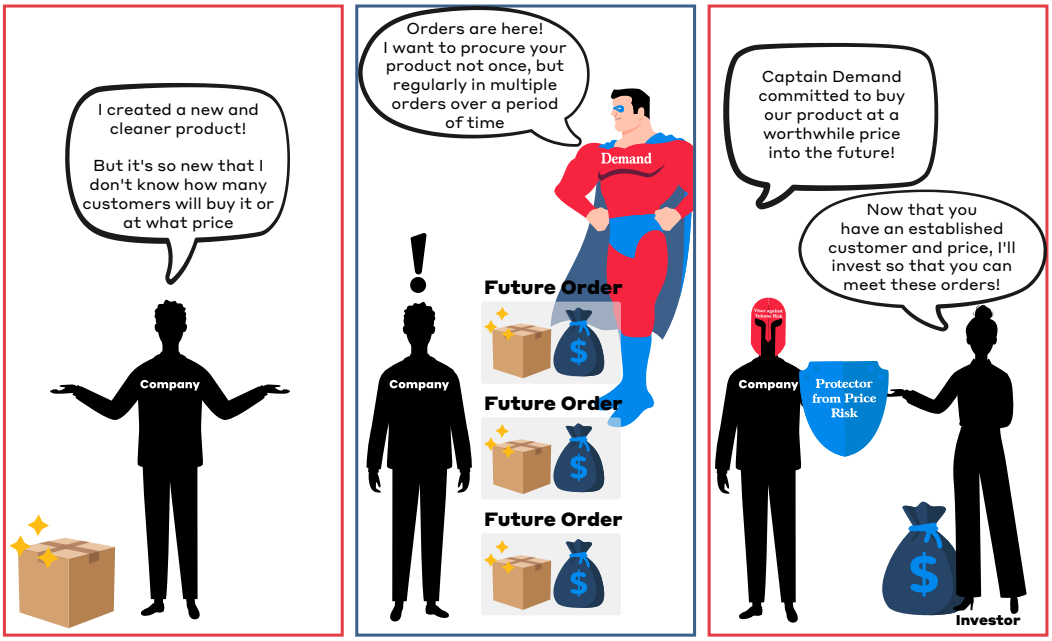
Under an offtake agreement, Captain Demand agrees to purchase a specified quantity of a product at an agreed-upon price in *multiple* orders over a long period of time, such as 10 years. In this way it differs from a forward contract, which only locks in a single future order. A common form of offtake agreement is a power purchase agreement (PPA), where a customer, usually a utility, government, or company, enters into a long-term agreement to purchase electricity from a generating company or project. PPAs have often been used to guarantee a customer and a price for renewable energy projects over a long period of time. Additionally, offtake agreements can include working capital or prepurchase agreements that provide the company with financing to help it kickstart development prior to delivery of the product.

Offtake agreements establish a customer base for a product and can help companies secure financing to build facilities, hire staff, and cover other startup expenses.

How does it help?

An offtake agreement is an enhanced form of procurement that mitigates both volume and price risk for new products or projects. Investors particularly value offtake agreements for companies producing a new or innovative product because they demonstrate the existence of a consistent customer who is willing to pay a viable price. This approach can have significant advantages over one-time direct procurement and forward contracts because it ensures that demand for the product will be sustained over a longer period of time. This can be important for products that are highly exposed to volume risk. Offtake agreements, especially when combined with access to working capital, offer an effective way to de-risk individual projects, provided the offtaker is interested in procuring the product.

Offtake Agreement



What's an example of an offtake agreement?

In 2021, British Airways announced an offtake agreement[15] with LanzaJet, a producer of sustainable aviation fuel (SAF), to purchase 7,500 tons of fuel additive annually. This agreement is one of the largest involving SAF and will help British Airways achieve its commitment to net-zero carbon emissions by 2050. Under the agreement, British Airways will provide LanzaJet with an undisclosed amount of working capital to build a SAF production plant in the state of Georgia; in addition, British Airways has agreed to purchase the fuel at a premium compared to conventional jet fuel.

The offtake agreement provides LanzaJet with a guaranteed customer and a worthwhile price for its SAF, de-risking investment in what is otherwise a premium-priced product for a very uncertain market. The agreement also provides British Airways with a guaranteed supply of SAF, which could be valuable if this product ends up being in short supply as other airlines follow suit and begin demanding low-carbon aviation fuel alternatives.

PRICE FLOOR WITH PROCUREMENT

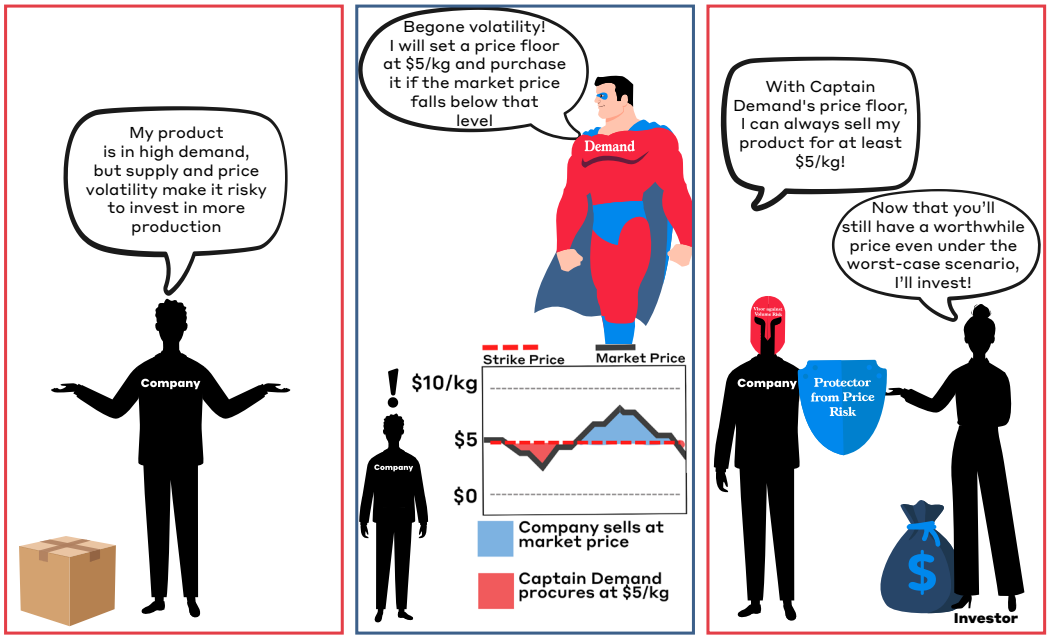
What is it?

Captain Demand can also commit to procure a product only if the market price falls below a predetermined level, or "reference price." This effectively sets a floor on the price that companies can expect to receive for their product regardless of future market developments. If the market price remains above the reference price, Captain Demand is under no obligation to procure the product, but either way, producers and investors are protected from price and volume risk.

How does it help?

Unlike other tools that address price and volume risk, a price floor with procurement does not prevent companies from seeking the highest price they can from other customers. A price floor is especially valuable for products that are subject to high price volatility and long lead times. Investing in such products can be risky because of the difficulty of forecasting market prices far in advance. With this tool, products that end up not being price competitive in the market still have a guaranteed customer at a price that justifies the initial investment.

Price Floor With Procurement



What's an example of a price floor?

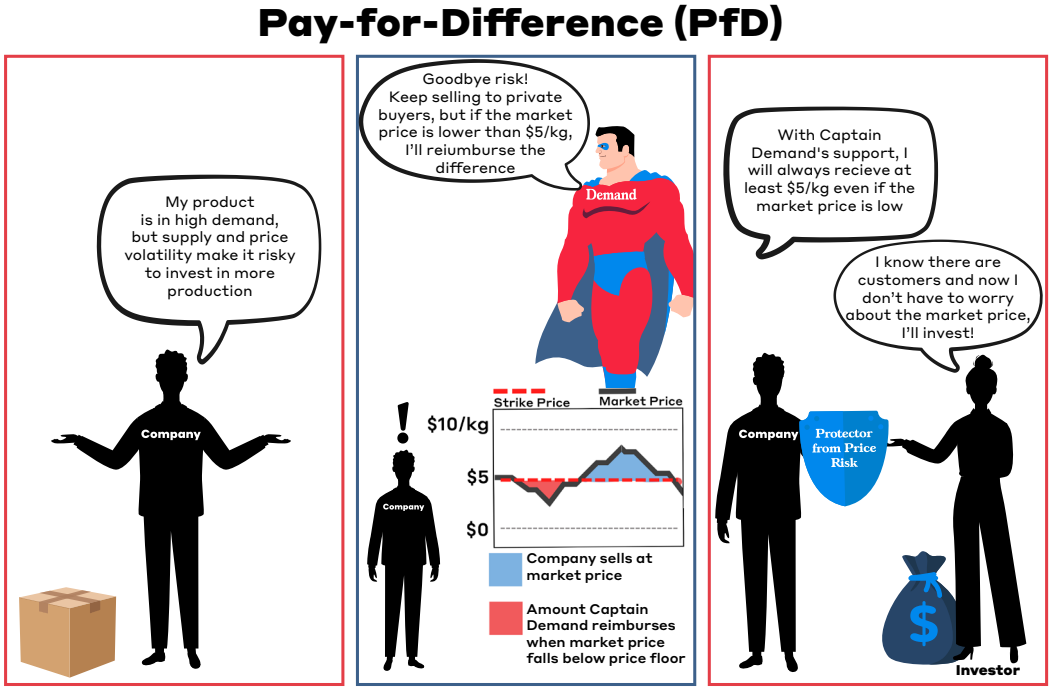
The USDA's Dairy Product Price Support Program (DPPSP) set reference prices[16] for processed dairy products, including butter ($1.05/pound), cheddar cheese blocks ($1.13/pound), and nonfat dry milk ($0.80/pound), and committed the federal government to purchase these products if the market price fall below the reference price. The aim of the program was to provide the dairy industry with the certainty needed to support investments in production regardless of market prices. Processed dairy products procured by the government under this program were used for food assistance programs. The 2014 Farm Bill replaced the dairy price support program with a pay-for-difference approach, as described below.

What is it?

Under the pay-for-difference (PfD) mechanism, Captain Demand enters into an agreement with a company to set a reference price for a product, which acts as a price floor. If the market price for the product falls below the reference price, Captain Demand reimburses the company for the difference between the market price and the reference price. If the company finds a buyer above the reference price, they sell to that buyer and Captain Demand is not involved. This tool provides the same price floor guarantee as the price-floor-with-procurement mechanism but does so by subsidizing private transactions rather than committing Captain Demand to procure the product.

How does it help?

A PfD directly addresses price risk by guaranteeing that companies will receive a minimum return on their sales even if the market price is low. This tool does not assist with volume risk. Even so, addressing price risk is often the primary concern for common products in volatile markets and a significant concern for cleaner versions of existing products that cost more to make than their conventional counterparts. Additionally, because a PfD subsidizes private transactions rather than having Captain Demand procure the product, it can be useful in helping buyers and sellers get acquainted with one another. Lastly, compared to a price floor with reimbursement, a PfD replaces the hassle of actually procuring, storing, and utilizing products with a simple transfer of funds to companies.



Note: This example shows how a PfD would work for a common product that experiences price volatility, as the USDA's Price Loss Coverage program does for agricultural commodities. However, PfDs can also be used to subsidize all transactions for superior products that are not cost-competitive, such as clean hydrogen.

What's an example of pay-for-difference?

The USDA Price Loss Coverage (PLC) Program[17] makes payments to farmers who opt into the program when the price of a covered product falls below a minimum reference price set by USDA. It is designed to protect farmers against losses due to unexpected drops in market prices. If the market price falls below the reference price, the farmer can sell at the market price and receive a payment from USDA equal to the difference. For example, the reference price for corn is set at $3.70 per bushel. If the market price of corn falls to $3.50 per bushel, the farmer sells the corn to a buyer at $3.50 and receives a payment from USDA equal to $0.20 per bushel.

CONTRACT-FOR-DIFFERENCES

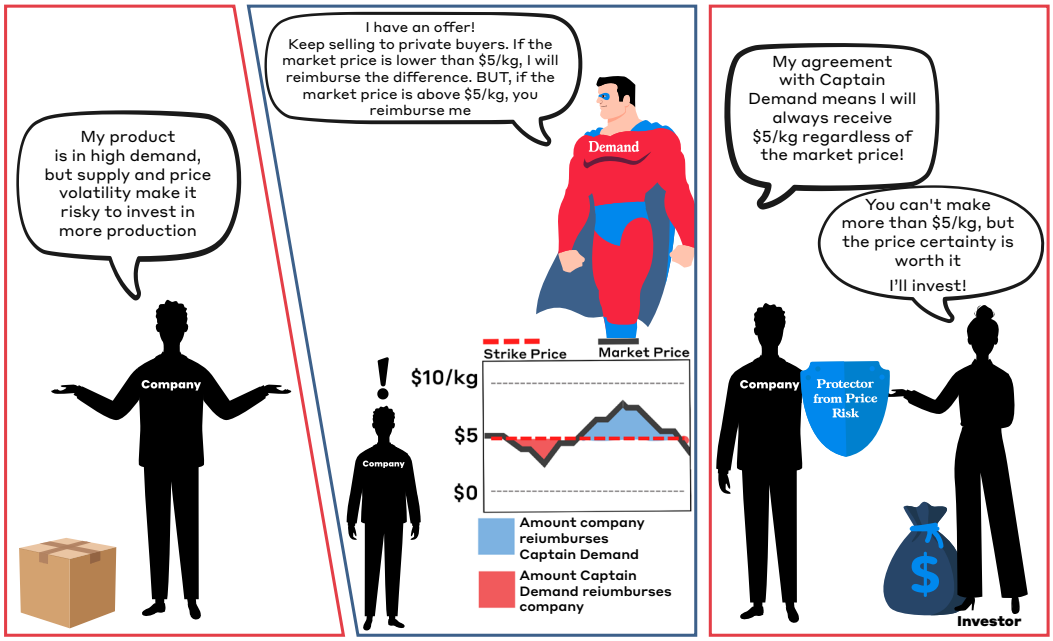
What is it?

While there are questions[18] about how the federal government could legally implement this mechanism in the United States, the concept of a contract-for-differences (CfD) builds on the pay-for-difference tool by adding a price ceiling that allows Captain Demand to be reimbursed for supporting a product that ends up being more profitable than expected. As in a PfD, a reference price is set for a specific product. If the market price falls below the reference price, Captain Demand reimburses the company for the difference. If the market price lands above the reference price, the company reimburses Captain Demand for the difference. Like PfDs, CfDs support private transactions, and Captain Demand's involvement is limited to disbursing or receiving funds.

How does it help?

Like PfDs, CfDs mitigate price risk but not volume risk. The combination of a price floor and price ceiling locks in the price the company will receive for its product, ensuring a worthwhile return on investment regardless of market conditions but also capping profit potential if prices swing upwards. For companies that sell common products to a large existing customer base but are also highly exposed to unexpected price volatility, alleviating price risk can be worth the tradeoff in limited profit potential. For cleaner products that are not price-competitive, a PfD and CfD may produce the same result if the market price never exceeds the reference price. However, unlike PfDs, CfDs create a new opportunity for Captain Demand to receive revenue in return for providing support if the cleaner product ends up commanding a higher market price.

Contract-for-Differences (CfD)



Note: As with PfDs, this example shows how a CfD would work for a common product that experiences price volatility. However, CfDs can also be used to subsidize superior products that are not cost-competitive. But, if the market price fails to exceed the strike price, the CfD and a PfD would result in the same support.

What's an example of a Contract-for-Differences?

The United Kingdom (U.K.) has adopted a CfD approach to bolster investment in offshore wind. In fact, CfDs now support most (65%)[19] of the operational and developmental capacity of the U.K. offshore wind industry. Under the program, the government guarantees a reference price for the electricity generated by a project over a set period of time, typically 15 years.[20] For example, following a competitive bidding process in 2022, the U.K. government offered[21] five projects a strike price of £37.35/MWh. If the market price for electricity is lower than £37.35/MWh, the government pays the difference to the project developer. If the market price exceeds £37.35/MWh, the company pays the difference to the government. Due to high energy prices across Europe over the past year, the U.K.'s CfD agreements generated more than £1 billion[22] for the government between April 2022 and March 2023.

MARKET MAKER

What is it?

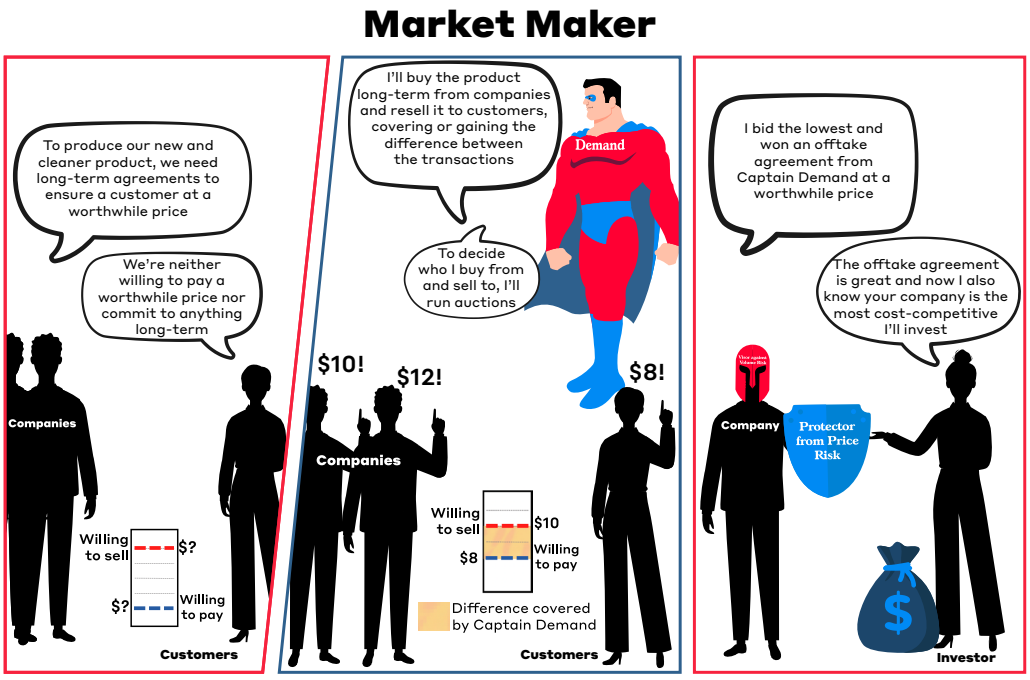
Captain Demand can act as a market maker by purchasing a product, reselling it to customers, and covering the cost difference between the two transactions. If the product sells for less than what Captain Demand bought it for, Captain Demand takes the loss. If the product sells for more than what Captain Demand bought it for, Captain Demand makes a profit. In this way, the market maker mechanism is similar to a CfD. However, unlike CfDs, Captain Demand needs to craft contracts to procure the product from companies and then find ways to sell the product to end-users.

The market maker function allows Captain Demand, acting as an intermediary, to use competitive processes to determine which suppliers to procure from and which end-users to sell to. For example, Captain Demand could use auctions to procure from the lowest bidding company and sell to the highest bidding customer, minimizing the difference between these transactions and providing price transparency[23] in the process. Price transparency is important for overall market health because it reveals the lowest price companies will sell for and the highest price customers will buy at.

Among available demand-side tools, market maker is likely the most intensive approach to set up and administer. Far from having a passive role, Captain Demand acts as an intermediary, determining which companies are eligible for support, matching buyers and sellers, crafting contracts, and possibly managing and transporting the product.

How does it help?

The market maker, or intermediary, internalizes volume and price risk in this approach. In contrast to a CfD, Captain Demand can tailor procurement to meet individual companies' needs, including by customizing contracts for products, such as long-term offtake agreements. As the seller of the product, Captain Demand can also tailor contracts to meet the needs of end-use customers. This flexibility is particularly valuable for products like clean hydrogen, where producers may need the certainty of long-term offtake agreements, while end-users prefer short-term transactions because they expect the market price to fall over time. Meanwhile, the price transparency this mechanism provides can be an important source of information to investors and end-users alike.



Note: This example shows how a Market Maker approach would work if Captain Demand utilizes a double-sided auction, as the H2Global Instrument does. However, Captain Demand can utilize a different type of competitive process that takes attributes other than cost, such as emissions, into account when deciding who to buy from and who to sell to.

What is an example of a market maker structure?

The European Union's H2Global Instrument[24] applies the market maker concept to clean hydrogen. In 2024, a third-party intermediary, Hintco, will begin procuring clean hydrogen derivatives (green ammonia, green methanol, green e-kerosene) from producers via long-term offtake agreements awarded through a reverse auction. Hintco will then sell the green hydrogen to end-users in short-term transactions using a regular auction. If the price to procure green hydrogen exceeds its selling price, H2Global will lose money on the transaction, and vice versa. The auction design maximizes price transparency by finding the lowest price hydrogen producers will sell at and the highest price end-users will purchase at—this should also minimize the cost of the subsidy per transaction. Additionally, the H2Global model includes separate end-user auctions for different emission sectors.

ADVANCE MARKET COMMITMENT

What is it?

An advance market commitment (AMC) flips the script compared to the other tools in the toolbox. Rather than focusing on an existing product, an AMC signals to companies that there will be demand for a type of product that *does not exist yet* or *has never been scaled up* for commercial production. A distinctive feature of an AMC, unlike most other tools, is that Captain Demand takes on technology risk by venturing into unproven territory where the product's functionality and scalability remain uncertain.

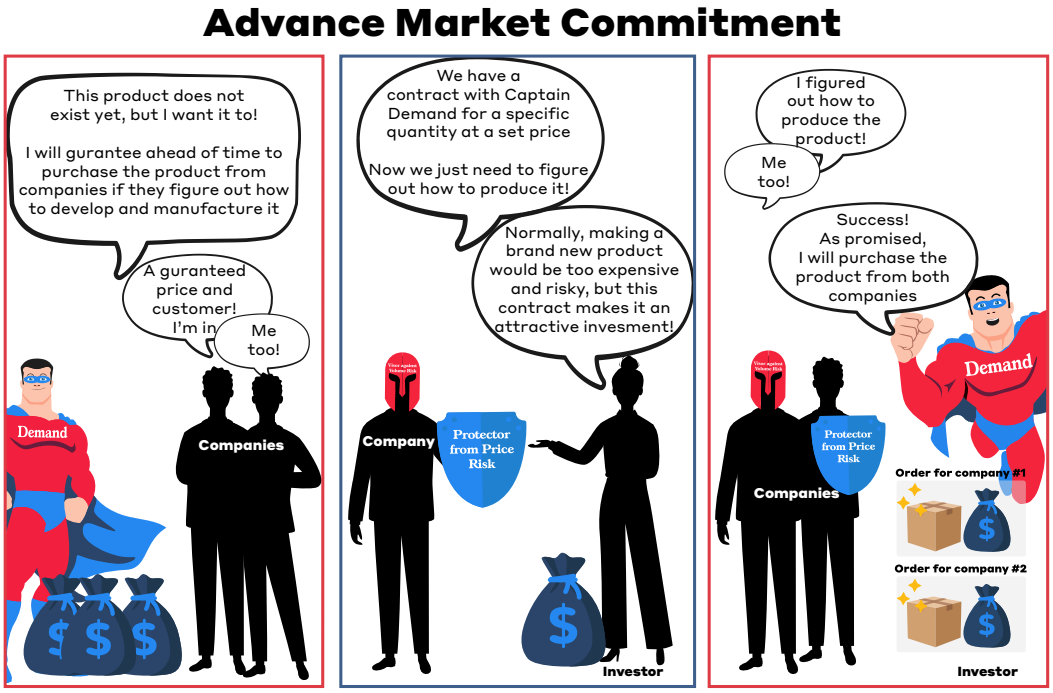
AMCs can take many shapes. In some designs, Captain Demand announces a lump sum of money[25] that is available to support offtake agreements, sometimes with working capital and prepurchase agreements, for a type of product if any company produces it. In other designs, a conglomerate of entities make a joint announcement[26] that they will be introducing new standards for products they already procure. In either case, the aim is to let companies know that a market and worthwhile price exists for a type of product if they can find a way to produce it at scale, while also creating incentives for companies to innovate in developing the best and lowest-cost production method.

If the goal is to develop a sizable market for a new and cleaner product, the AMC can be designed to consider attributes beyond cost. For example, production methods that might be more expensive today could also have greater potential for scale-up or achieve lower emissions.

How does it help?

Producing new and innovative products at scale can be extremely difficult and risky, especially when companies are unsure how much demand there will be. AMCs can address this issue by guaranteeing demand for a general type of product without prescribing how the product is made. The announcement of an AMC mitigates volume and price risk for interested companies, providing the confidence to support investments in developing a product that can win an offtake agreement under the AMC. Once an offtake agreement is secured, volume and price risk are mitigated and the company can focus on production, which comes with its own set of supply-side risks.

AMCs are especially useful for certain products, like vaccines[27], that provide considerable societal benefits but require a rigorous and expensive process to develop. For a pharmaceutical company unsure how much demand might exist for a yet-to-be-developed vaccine, an AMC can mitigate project risks by guaranteeing that Captain Demand will purchase the vaccine at a price that justifies the company's investment.



What are examples of an advance market commitment?

- In 2020, the U.S. government formed Operation Warp Speed (OWS)[28] to accelerate the creation and deployment of COVID-19 vaccines, primarily by signaling to pharmaceutical companies that there is approximately $18 billion[29] worth of demand for vaccines if they are developed and manufactured. OWS entered into contracts with seven companies. Prior to the vaccine being developed, OWS agreed to pay Moderna nearly $5 billion for 300 million doses upon delivery with an additional $1 billion provided upfront in the form of a development grant. OWS also agreed to pay Pfizer $6 billion for 300 million doses upon delivery, but did not provide a development grant. Not knowing ahead of time which type of vaccine technology would work best, OWS prioritized creating a portfolio of different types of vaccines. For example, Pfizer and Moderna used breakthrough mRNA technology that requires ultra cold storage while Johnson & Johnson used traditional vaccine technology that only requires refrigerator storage. OWS successfully accelerated vaccine development from 10 or more years to about 18 months.
- In 2022, multiple major companies came together to establish the Frontier AMC[30] with an initial fund of about $1 billion to purchase carbon captured from the atmosphere using so-called carbon dioxide removal (CDR) technologies. The Frontier AMC is entering into offtake agreements for captured carbon from companies that meet specific criteria set by the fund; the fund may also provide working capital for CDR projects to get them off the ground. Various CDR technologies and strategies are available, each with different characteristics in terms of cost, energy usage, scale-up potential, and storage processes. Frontier prioritizes creating a portfolio of technologies and will pay different prices for different types of projects based on their long-term potential. This AMC structure addresses volume risk by putting up the funds to support $1 billion worth of demand, manages price risk by accommodating different carbon prices and offtake agreements, and empowers companies to determine the optimal path to scaling and commercializing CDR technologies.

Designing the Right Tool for the Mission

WHICH RISKS NEED TO BE ADDRESSED?

If a demand-side support tool does not address the specific risk(s) that companies face, it will fail to catalyze private sector investment and increase production of new clean energy technologies. As seen below, some tools address only volume risk, some address only price risk, and many address both.

Volume Risk Tools

- Direct Procurement

Price Risk Tools

- Consumer Tax Credit
- Pay-for-Difference
- Contract-for-Differences

Both

- Procurement Standard
- Market Standard
- Offtake Agreement
- Forward Contract
- Market Maker
- Price Floor w/ Procurement
- Advance Market Commitment

- Volume Risk Tools: Tools in this category increase total demand for a product but do so at the market price. Direct procurement is the only pure volume risk tool included in this guide. However, if the market price for a product is too low to sustain production, this tool will not be effective.
- Price Risk Tools: Tools in this category subsidize the cost of a product, thereby ensuring either that the product is cost-competitive in the market or that potential price volatility is sufficiently mitigated to avoid underinvestment in production. If a product has (or is likely to attract) interested customers but is more expensive than conventional alternatives—such as a less carbon-intensive drop-in fuel—providing a subsidy can help close the price gap. Price risk tools alone may not be sufficient to catalyze increased demand for products that face larger barriers to adoption, such as products that require users to make other changes or investments.

- Both: Many tools in this guide mitigate both volume and price risk. They may combine procurement requirements or standards with price subsidies to help cleaner products find customers at a viable price. Products that are neither cost-competitive nor have an established customer base are best supported by tools that can mitigate both concerns for investors. However, many of these tools present implementation challenges in terms of regulatory authority, procurement resources, and overall administrative complexity.

WHAT IS CAPTAIN DEMAND'S KRYPTONITE?

Just as all superheroes have a weakness—call it their kryptonite—demand-side support tools do too. Choosing the right tool for the job requires a clear understanding of the risks that need to be mitigated *and* a judgment about whether available resources and management capabilities are adequate to support effective implementation. If not, the impact of the demand-side support will be muted.

- Managing Procurement: Tools that involve direct product procurement require that there be a plan for either using the product, managing and storing the product for future use, or selling the product to other end-users. In any of these scenarios, Captain Demand must arrange transportation and storage for the product or cover the cost of someone else doing so. Procurement might be straightforward if the product has an immediate and obvious use, like USDA's BioPreferred products. If Captain Demand doesn't have an immediate use for the product and if the product is challenging to store, like hydrogen, procurement policies can become a significant hassle and may even necessitate the construction of new storage facilities and transportation infrastructure. Although the Strategic Petroleum Reserve exists to reduce the economic and national security risks associated with potential oil supply disruptions, it illustrates the requirements that can come with large-scale procurement. Operating the reserve, which involves purchasing and storing large quantities of petroleum in enormous salt caverns, requires nearly 1,000 employees[31] and costs the federal government hundreds of millions of dollars.[32]
- Complex Administration: Some demand-side support tools are clearly more complex to administer than others. For example, a consumer tax credit simply requires Captain Demand to determine which products are eligible and then implement tax rules to provide the credit. On the other end of the spectrum, acting as a market maker involves running a competitive procurement process, taking ownership of the product (which may necessitate transportation and storage), and running a competitive process to sell the product to end-users. Tools that involve competitive processes,

product management, reference price setting, and more, require operational expertise and are more costly to implement; they may also take longer to deploy, leaving companies without support in the interim.

- Lack of Authority: Some demand-side tools require special authority, which Captain Demand may or may not possess. If Captain Demand lacks regulatory authority, market standards are off the table. If Captain Demand cannot alter tax policy, consumer tax credits are not an option. Other tools can be utilized regardless of authority, but funding constraints may further limit the options that are available.
- Limited Funding: If Captain Demand is short of funding, it becomes vital to consider how demand-side supports can be designed to leverage private investment and maximize impact per public dollar spent. For example, if only $10 million is available to spend on demand-side support for low-carbon concrete, a single offtake agreement may consume the entire budget, but a pay-for-difference scheme might suffice to subsidize multiple private transactions and stimulate more total demand per dollar. It's also important to ensure that funding isn't spread so thin that it fails to have any impact at all. For example, $10 million for a consumer tax credit may amount to a negligible subsidy for some products and therefore fail to meaningfully increase customer demand.

SHOULD DEMAND-SIDE SUPPORT BE BROAD OR TARGETED?

Demand-side support can be applied broadly to an entire industry or it can target individual companies through bilateral agreements. This decision primarily depends on which tool is being utilized and on funding and other constraints.

- Broad: Providing demand-side support to an entire industry can be an effective way to catalyze large-scale investments, but it can also be expensive and impractical, depending on the tool. Some tools, such as market standards and consumer tax credits, are necessarily broad. Others, such as direct procurement, necessarily entail bilateral agreements between Captain Demand and individual companies. For these tools, the question is how many companies will be able to participate. If procurement is involved, this can be tricky. For instance, USDA's Dairy Product Price Support Program provided a price floor with procurement for the dairy industry. However, if the market price of supported products dropped too low for too long, USDA would be forced to reduce its reference prices to keep program costs within budget and avoid procuring more products than it could manage.

- Targeted: In situations where funding is constrained and setting market standards isn't feasible, targeted demand-side support is likely the best option. Captain Demand can target direct procurement, offtake agreements, pay-for-difference contracts, and other tools that involve bilateral agreements to specific companies through a competitive process. Auctions or other competitive processes can be used to minimize support costs. Alternatively, Captain Demand can incorporate other considerations in the competitive process, such as emissions reduction benefits, scale-up potential, or opportunity to establish a customer base with a high willingness to pay. The key to targeted support is determining which companies or customers will most effectively catalyze private investment and help establish an industry that is ultimately self-sufficient and not dependent on long-term outside support.

HOW LONG WILL SUPPORT BE NEEDED?

The answer to this question depends on the specific risks associated with a product or sector. In some cases, early support to get an industry off the ground might be all that's required. In other cases, persistent risks might necessitate longer-term support.

- Short-Term Risk: In the short-term, demand-side support can help kickstart the production of new and innovative products and get them to market. At that point, other impediments to self-sustaining production might recede, as the product is refined to meet customer needs and begins to attract an established customer base, and as the producer pays down capital costs and improves the production process to drive down operating costs. Once a product is cost-competitive and has an established customer base, demand-side support is no longer needed.
- Long-Term Risk: In the long-term, markets for certain products, especially products that are traded internationally, may continue to be subject to high price volatility. This volatility—which can have multiple root causes, from vulnerability to weather events to geopolitical tensions—can deter stable investment because it creates uncertainty about future market demand and cost-competitiveness. In these cases, demand-side support to address persistent price risk may be needed for a longer period of time.

Conclusion

Our journey through the realm of demand-side support has illuminated the many tools that exist for harnessing the power of the market to launch new and innovative products.

These tools range from relatively simple approaches, such as direct procurement to guarantee a minimum level of demand, to more complex mechanisms such as contract-for-differences to address price risks. Each tool has the potential to play a vital role in de-risking specific markets or projects to catalyze private investment. Captain Demand cannot launch these markets by themselves. The toolbox can help convince private sector friends to come along for the ride, and eventually lead the way.

Surveying these possibilities, it's important to remember that there is no one-size-fits-all solution. Different products, industries, markets, budgets, and political environments require tailored solutions. If a tool does not address the key risks companies face, if funding is spread too thin to incentivize investment, if administering the tool is overly complicated, and if the overall approach fails to garner support and maintain private sector confidence, the mission will fail. With critical climate and energy goals on the line, there's no time to lose in choosing the right tools and unleashing the superpowers of Captain Demand.

Endnotes

1 H2Global Stiftung. "The H2Global Instrument." Available at: https://www.h2-global.de/project/h2g-mechanism.

2 Frontier. "An Advance Market Commitment to Accelerate Carbon Removal." Available at: https://frontierclimate.com/.

3 DOE Office of Clean Energy Demonstrations. "Public Insight Requested for Demand-Side Support for Clean Energy Technologies." February 2, 2023. Available at: https://www.energy.gov/oced/articles/public-insight-requested-demand-side-support-clean-energy-technologies.

4 DOE Office of Clean Energy Demonstrations. "DE-FOA-0003187: DEMAND-SIDE RFP FOR INDEPENDENT ENTITY." October 24, 2023. Available at: https://oced-exchange.energy.gov/Default.aspx#FoaId8e15135b-a033-47ca-9c7a-ebf2e5771a41.

5 James Chen. "Spot Price: Definition, Spot Prices vs. Futures Prices, Examples." Investopedia, January 31, 2021. Available at: https://www.investopedia.com/terms/s/spotprice.asp.

6 James Chen. "What Is a Reverse Auction? How It Works, Example, and Risks." Investopedia, July 31, 2023. Available at: https://www.investopedia.com/terms/r/reverse-auction.asp#:~:text=A%20reverse%20auction%20is%20a,goes%20to%20the%20highest%20bidder.

7 GOVTribe. "Batteries Rechargeable." Available at: https://govtribe.com/category/psc/6140-batteries-rechargeable.

8 GOVTribe. "Battery Energy Storage System (BESS). # W9132T22Q0014." January 20, 2022. Available at: https://govtribe.com/opportunity/federal-contract-opportunity/battery-energy-storage-system-bess-w9132t22q0014.

9 Meron Tesfaye, Ph.D. "Economic-Environmental Win-Wins: Biobased Products in the 2023 Farm Bill." Bipartisan Policy Center, May 12, 2023. Available at: https://bipartisanpolicy.org/blog/biobased-products-2023-farm-bill/.

10 DOE Energy Efficiency and Renewable Energy. "Appliance and Equipment Standards Program." Available at: https://www.regulations.doe.gov/eecompass/appliance-standards.

11 DOE Office of Policy. "Making Our Homes More Efficient: Clean Energy Tax Credits for Consumers." December 21, 2022. Available at: https://www.energy.gov/policy/articles/making-our-homes-more-efficient-clean-energy-tax-credits-consumers.

12 Kevin Purdy. "Heat Pumps vs. AC — Why Upfront Costs Can Be Misleading." Carbon Switch. Available at: https://carbonswitch.com/heat-pump-vs-ac/.

13 Will Kenton. "Lead Time: Definition, How It Works, and Example." Investopedia, September 28, 2023. Available at: https://www.investopedia.com/terms/l/leadtime.asp.

14 U.S. Department of Energy. (2022, October 18). DOE announces continued action to protect American consumers and address global supply disruption caused by Putin's energy price hike. Retrieved from https://www.energy.gov/articles/doe-announces-continued-action-protect-american-consumers-and-address-global-supply

15 Jonathan Shieber. "LanzaJet inks deal with British Airways for 7,500 tons of low-emission fuel additive per year." TechCrunch, February 9, 2021. Available at: https://techcrunch.com/2021/02/08/lanzajet-inks-deal-with-british-airways-for-7500-tons-of-fuel-low-emission-fuel-additive-per-year/.

16 USDA Farm Service Agency. "Dairy Product Price Support Program (DPPSP), Formerly the Milk Price Support Program (MPSP)." August 2011. Available at: https://www.fsa.usda.gov/Internet/FSA_File/dppsp_en_fact_sheet.pdf.

17 USDA Farm Service Agency. "Agriculture Risk Coverage (ARC) & Price Loss Coverage (PLC)." Available at: https://www.fsa.usda.gov/Assets/USDA-FSA-Public/usdafiles/FactSheets/2022/fsa_arc_plc_factsheet_101922.pdf.

18 Cory Mitchell. "Contract for Differences (CFDs) Overview and Examples." Investopedia, Updated June 22, 2023. Available at: https://www.investopedia.com/articles/stocks/09/trade-a-cfd.asp#:~:text=Why%20Are%20CFDs%20Illegal%20in,is%20a%20concern%20for%20regulators.

19 "Westwood Insight: UK CfD Auction Analysis." Offshore Source, August 09, 2022. Available at: https://www.offshoresource.com/news/renewables/westwood-insight-uk-cfd-auction-analysis.

20 Katherine Monahan and Marisa Beck. "The United Kingdom's Contracts for Difference policy for renewable electricity generation." Canadian Climate Institute, February 14, 2023. Available at: https://climateinstitute.ca/publications/uk-contractsfor-difference-policy-for-renewable-electricitygeneration/.

21 "Westwood Insight: UK CfD Auction Analysis." Offshore Source, August 09, 2022. Available at: https://www.offshoresource.com/news/renewables/westwood-insight-uk-cfd-auction-analysis.

22 Katherine Monahan and Marisa Beck. "The United Kingdom's Contracts for Difference policy for renewable electricity generation." Canadian Climate Institute, February 14, 2023. Available at: https://climateinstitute.ca/publications/uk-contracts-for-difference-policy-for-renewable-electricity-generation/.

23 Adam Hayes. "Price Transparency: Meaning, Costs, Improvement." Investopedia, August 31, 2023. Available at: https://www.investopedia.com/terms/p/pricetransparency.asp#:~:text=Price%20transparency%20typically%20refers%20to,a%20specific%20stock%20is%20available.

24 H2Global Stiftung. "The H2Global Instrument." Available at: https://www.h2-global.de/project/h2g-mechanism.

25 Frontier. "An Advance Market Commitment to Accelerate Carbon Removal." Available at: https://frontierclimate.com/.

26 Heather Clancy. "First Movers Coalition buying pledges reach $12 billion and counting." GreenBiz, November 9, 2022. Available at: https://www.greenbiz.com/article/first-movers-coalition-buying-pledges-reach-12-billion-and-counting#:~:text=The%20overarching%20mission%20of%20First,be%20able%20to%20scale%20commercially.

27 World Health Organization. "COVAX: Working for global equitable access to COVID-19 vaccines." Available at: https://www.who.int/initiatives/act-accelerator/covax.

28 "Operation Warp Speed Contracts for COVID-19 Vaccines and Ancillary Vaccination Materials." March 1, 2021. Available at: https://crsreports.congress.gov/product/pdf/IN/IN11560.

29 Stephanie Baker and Cynthia Koons. "Inside Operation Warp Speed's $18 Billion Sprint for a Vaccine." Bloomberg, October 29, 2020. Available at: https://www.bloomberg.com/news/features/2020-10-29/inside-operation-warp-speed-s-18-billion-sprint-for-a-vaccine.

30 Frontier. "An Advance Market Commitment to Accelerate Carbon Removal." Available at: https://frontierclimate.com/.

31 DOE, Office of Cybersecurity, Energy Security, and Emergency Response. "SPR Frequently Asked Questions (FAQs)." Available at: https://www.energy.gov/ceser/spr-faqs#Q18.

32 Congressional Research Service. "The Strategic Petroleum Reserve: Background, Authorities, and Considerations." May 13, 2020. Available at: https://crsreports.congress.gov/product/pdf/R/R46355.

Bipartisan Policy Center

1225 Eye St NW, Suite 1000
Washington, DC 20005

bipartisanpolicy.org

202 - 204 - 2400

The Bipartisan Policy Center helps policymakers work across party lines to craft bipartisan solutions. By connecting lawmakers across the entire political spectrum, delivering data and context, negotiating policy details, and creating space for bipartisan collaboration, we ensure democracy can function on behalf of all Americans.

@BPC_Bipartisan
facebook.com/BipartisanPolicyCenter
instagram.com/BPC_Bipartisan

Policy Areas

- Business
- Child Welfare Initiative
- Democracy
  - American Congressional Exchange
  - Campus Free Expression
  - Digital Democracy
  - Elections
  - Presidential Leadership
  - Structural Democracy
- Early Childhood
- Economy
  - Debt Limit
  - Higher Education
  - Immigration
  - Paid Family Leave
- Energy
- Health
- Housing
- Infrastructure
- Technology

Bipartisan Policy Center

1225 Eye Street NW, Suite 1000
Washington, D.C. 20005

Where democracy gets to work