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TO BRING EMISSIONS-SLASHING TECHNOLOGIES TO MARKET, THE UNITED STATES NEEDS TARGETED DEMAND-PULL INNOVATION POLICIES

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Introduction

President-elect Joe Biden has called climate change one of the four most important crises facing the country and pledged ambitious climate action.[1] At the heart of his strategy to slash US and global emissions is a focus on developing new and improved technologies to make clean energy transitions more affordable. During the campaign, Biden pledged a "historic investment in clean energy innovation."[2] Indeed, boosting funding for energy research, development, and demonstration (RD&D) is widely popular among both Republicans and Democrats and represents a rare legislative opportunity for advancing climate policy under a razor-thin Democratic majority in Congress.[3] In December 2020, Congress passed the most sweeping energy legislation in a decade, attached to the $900 billion COVID-19 stimulus package, and authorized boosting clean energy RD&D funding.[4]

Yet such investments alone may not be sufficient to successfully commercialize critical clean energy technologies. Today's energy industry presents daunting barriers that impede the swift adoption of newer, cleaner technologies. As a result, the private sector underinvests in scaling up promising technologies and building out clean energy infrastructure.[5] Therefore, in addition to funding energy RD&D ("technology-push" policies), government policies should bolster market demand for clean energy to encourage private investors and firms to scale up and commercialize new technologies ("demand-pull" policies).

Still, there are steep political obstacles in the way of many ambitious demand-pull policies. For example, President-elect Biden has called for economywide measures such as a clean electricity standard and $400 billion of public procurement of clean products such as electric vehicles.[6] These policies would create large markets for mass deployment of clean energy and speed a clean energy transition. But enacting them requires substantial new regulations and appropriations from Congress, a challenging feat even given the new Democratic control of both chambers of Congress.

Fortunately, there is a set of targeted demand-pull measures that the Biden administration can immediately use—with existing statutory authority and without requiring massive new appropriations—to create early markets for promising clean energy technologies. These

measures, which we call "demand-pull innovation policies," fill a niche between RD&D investments that create new technology options and policies that support the large-scale deployment of clean energy. Demand-pull innovation policies focus narrowly on creating and shaping early markets for emerging technologies. For example, targeted government procurement, prize competitions, or milestone payments can provide early markets for clean energy technologies that have been developed with the aid of public RD&D funding. The government can also coordinate private procurement or otherwise catalyze private market adoption through certification and standard-setting processes. Such demand-pull innovation policies have extremely high leverage and have transformed limited public investment into flourishing private commercial markets across the space, medical, and energy fields.[7]

Coherently pursuing demand-pull innovation policies will require coordination across the federal government. To this end, the incoming Biden administration should consider creating a new government office, the Energy Technology Markets Office (ETMO), to spearhead the scale-up and commercialization of promising clean energy technologies. The ETMO could be housed within the Department of Energy (DOE) to take advantage of the DOE's deep expertise in energy technologies and markets. Indeed, in the recently passed Energy Act of 2020 (Division Z of the Consolidated Appropriations Act of 2021), Congress directed the DOE to build its capabilities to pursue demand-pull innovation policies.[8] In the same legislation, Congress also authorized the DOE's Office of Technology Transitions, which could alternatively lead the demand-pull innovation agenda. Regardless of whether the administration creates a new office or augments an existing one, in order to maximize their potential impact, demand-pull innovation policies should not be the domain of only the DOE. Rather, the DOE should collaborate with a range of federal agencies—many of which, such as the Department of Defense, have sizable resources to invest in emerging technology procurement—to enact policies and pursue public-private partnerships to build market demand for the innovations critical to decarbonization. In concert with new RD&D investments in clean energy innovation, demand-pull innovation policies could be a powerful tool to speed the adoption of new technologies and cultivate advanced energy industries that can manufacture and export US innovations.

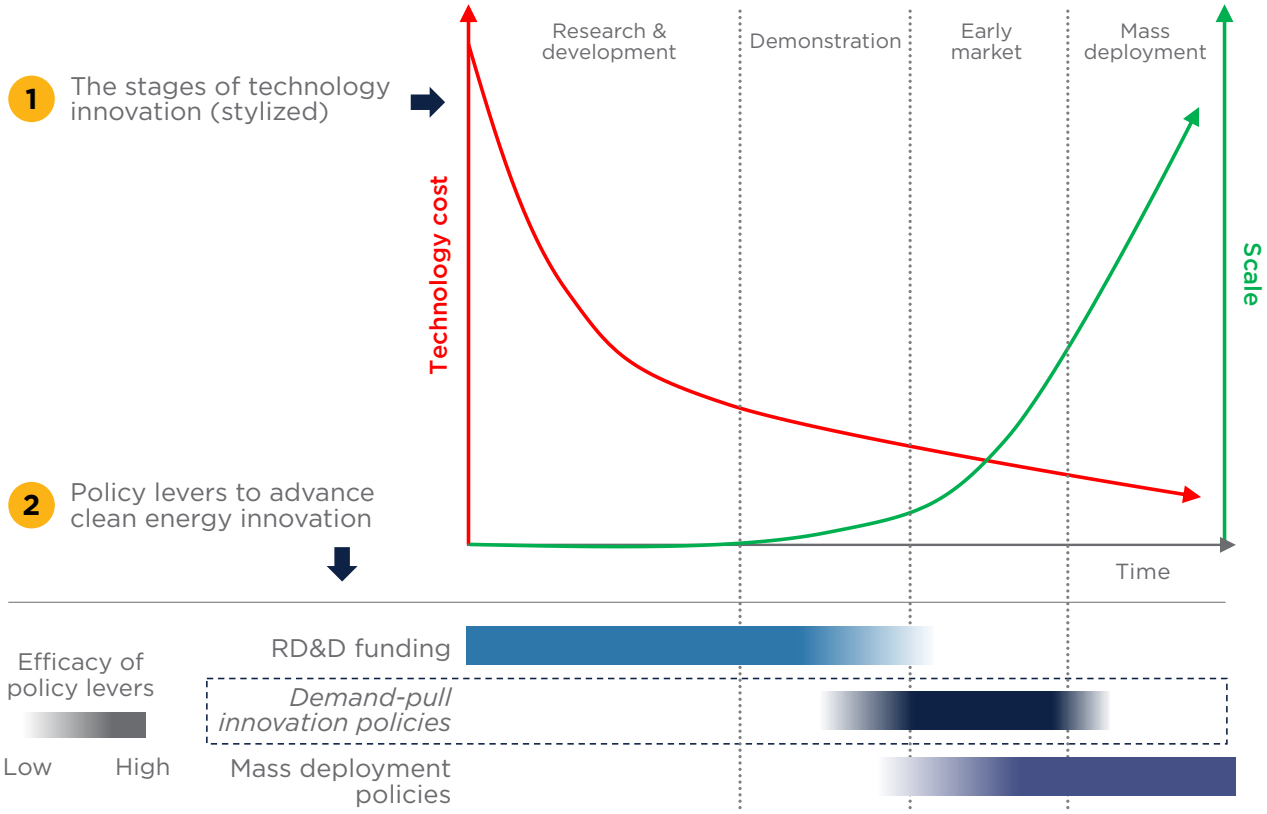
The Critical Role of Demand-Pull Innovation Policies

The urgent need for clean energy innovation to combat climate change is well-documented. For example, the International Energy Agency warns that out of 46 critical technologies for combating climate change, 40 technologies are not on track for the rapid improvements in cost and performance needed for widespread deployment to rein in emissions and meet the Paris Agreement's 2°C climate goal.[9] Roughly half of the global emission reductions to achieve a swift and cost-effective net-zero transition must come from technologies that have not yet reached commercial markets.[10] Recognizing the need to rapidly develop new and improved clean energy technologies, the Biden "Build Back Better" platform aims to "drive dramatic cost reductions in critical clean energy technologies, including battery storage, negative emissions technologies, the next generation of building materials, renewable hydrogen, and advanced nuclear—and rapidly commercialize them, ensuring that those new technologies are made in America."[11]

Doing so will require three categories of carefully coordinated policies that support clean energy technologies across all stages of technological development (figure 1).[12] The first category, technology-push policies, involves investments in clean energy RD&D to push

technologies through the innovation pipeline toward commercial maturity. By launching a National Energy Innovation Mission and tripling federal funding for clean energy innovation, the Biden administration and the next Congress can seed that pipeline with promising technologies (a recent Columbia University analysis by Sivaram et al. lays out a roadmap to do just that).[13] Moreover, such investments could help shore up US global competitiveness in growing global clean energy industries, just as countries such as China are investing heavily in the production and export of advanced technologies to position themselves for a lower-carbon future global economy.[14]

Figure 1: Why demand-pull innovation policies are critical to commercializing clean energy technologies



In addition to clean energy RD&D, a low-cost pathway to net-zero emissions requires a second category of policies to promote the large-scale deployment of clean energy, such as pricing carbon or enacting clean energy standards. These policies face political barriers, especially at the US federal level. They are also not targeted at mediating the transition of technologies from RD&D to commercial scale-up. These policies are most effective at supporting the mass deployment of mature clean energy technologies rather than creating niche markets to begin scaling up emerging technologies with higher risk profiles and costs.[15]

Therefore, it will also take a third set of measures—demand-pull innovation policies—to speed the scale-up and commercialization of technologies developed by US universities, firms, and federal laboratories. Previous research has distinguished between targeted demand-pull

policies that focus on individual technologies and broader, technology-neutral demand-pull policies.[16] We introduce a different distinction based on the stage of a technology's progress toward commercialization. Demand-pull innovation policies are measures targeted at creating early markets for emerging technologies and tend to be technology-specific. We distinguish them from mass deployment policies—both technology-neutral ones, such as carbon pricing, and technology-specific ones, such as current tax incentives for wind or solar power—which support the large-scale diffusion of more mature technologies. Because mass deployment policies are politically challenging to enact, demand-pull innovation policies that are cheaper and use existing authorities can serve as imperfect substitutes. But to be clear, both demand-pull innovation policies and mass deployment policies are important and complementary elements of a comprehensive suite of climate policies—and the Biden administration and Congress now have the benefit of unified government to collaborate closely on enacting such an ambitious package.

Demand-pull innovation policies can play a critical role in helping emerging technologies achieve the scale and maturity needed for wider market diffusion. In the energy sector, promising technologies—even those that have been successfully demonstrated a handful of times—face a steep uphill path to commercial success. Customers are often scarce, particularly in concentrated and highly regulated energy industries. Incumbent energy companies, such as electric power utilities, are often slow to adopt new technologies and reluctant to overhaul existing infrastructure.[17] Moreover, a lack of enabling infrastructure, such as pipelines for clean hydrogen or captured carbon dioxide, can also impede clean technology adoption. Aware of the risks facing new technologies, private investors can be unwilling to invest substantial capital in building out manufacturing capacity or funding business development for technologies offering uncertain returns.[18] As a result of these barriers, technology-push policies alone cannot bring new technologies to market, a conclusion supported by recent evidence that technology-push grants from the DOE's Advanced Research Projects Agency-Energy measurably improved patenting rates but not necessarily business outcomes of recipient firms.[19]

Demand-pull innovation policies aim to lower these barriers to market adoption of new clean energy technologies.[20] They can create initial market niches for new clean energy products to provide investors and firms commercial certainty when investing in developing and scaling risky technologies. The most direct route for the government to create an initial market is through public procurement of a new technology that meets specified performance requirements. The goal is to enable a clean energy technology to improve its performance and achieve a threshold level of scale by serving this initial market such that private investors will be emboldened to continue scaling up the technology on their own to serve a larger, self-sustaining market. Along the way, the technology becomes even more competitive as the industry matures and learns to increase scale at lower cost. A recent study of demand-pull policies across the United States and Europe found empirical evidence that public procurement targeting innovative technologies can spur large-scale market diffusion of those technologies.[21]

Because direct government funds are limited, policy makers may also opt for "catalytic" demand-pull innovation policies that coordinate private-sector customers to create a commercial market for a new technology. This approach has a long tradition of success. For example, in the 1980s, the Swedish government organized private real estate companies and utilities to purchase energy-efficient lighting, stimulating the market adoption of innovative products.[22] More recently, the US DOE has successfully catalyzed consortia of private buyers for clean energy technologies such as efficient air conditioners, which we discuss in more detail in a subsequent section.

Several other demand-pull innovation policies can create early markets for emerging technologies by efficiently marshaling public funds to mobilize private investment. For example, the federal government can sponsor a competition that awards a prize for the development of a new technology that meets certain technical specifications—in effect creating a first market for that technology. Such competitions can stimulate many research teams and firms to invest in technology development, often mobilizing even more private investment than the prize money that the government awards the winner.[23] Another approach is to award milestone payments for each successfully completed stage of a technology's development. This policy, in effect, is creating a first market for each of the intermediate steps of a technology's development. To be clear, prizes and milestone payments are distinct from RD&D investments, which are awarded for the development of technologies whether or not those efforts succeed. The incentives offered by demand-pull innovation policies only pay out after the successful completion of RD&D activities that create technologies that perform as specified. In this way, when carefully designed to target initial market creation—rather than full-scale deployment—demand-pull innovation policies can produce enormous returns on limited taxpayer investment by seeding self-sustaining commercial markets.

Under the Obama administration, the United States laid the foundation for a suite of demand-pull innovation policies. For example, the White House published "A Strategy for American Innovation" in 2015, emphasizing prizes and other demand-pull approaches.[24] And although the Trump administration sought to slash funding for clean energy innovation, it did develop promising prize competitions known as "American-Made Challenges" to support a range of advanced clean energy technologies.[25]

Still, aside from isolated policies, the US government lacks a coherent and large-scale demand-pull strategy. This is worrying not only because US-led innovation is critical to global decarbonization efforts, but also because countries around the world are actively pursuing industrial strategies to capture market share in growing global advanced energy industries, such as hydrogen, electric vehicles, and batteries.[26] In Germany and elsewhere in Europe, reforms to public contracting laws have made it easier for governments to procure innovative technologies, and companies responding to such tenders have increased their rates of innovation as a result.[27] In the United States, some agencies such as the Department of Defense have the latitude to target public procurement to create early markets for innovative technologies, but most public procurement for energy products and services does not prioritize innovation.[28] Reserving at least a small fraction of public procurement authority to target the commercialization of innovative technologies can produce outsize returns to the economy in comparison to the required public expenditure.

The US government can pursue a range of underutilized contracting approaches, legal authorities, and other demand-pull measures. President-elect Biden has signaled that his administration will take decisive measures to create markets for clean energy technologies. During the campaign, Biden called for $400 billion of public procurement during his first term to buy clean energy products such as batteries and electric vehicles.[29] Although it may prove politically challenging to raise that magnitude of funding for mass deployment of mature clean energy technologies, it would only take a small fraction of that sum—using existing agency contracting authority—for the federal government to create early markets for emerging technologies. The successful track record policy makers have amassed across multiple sectors of the US economy in inducing innovative technologies should inspire a focused effort to scale and commercialize clean energy technologies.

Successful Demand-Pull Models from Health, Space, and Energy

Each of the following three examples illustrates a different model of how government demand-pull innovation policies have driven technology commercialization—and the potential for using that model to scale up advanced clean energy technologies.

1. Advance Market Commitments for Lifesaving Vaccines

In 2020, biotechnology firms raced to develop vaccines to protect against COVID-19. By the end of the year, the US government had approved two vaccines on a limited basis.[30] The US government and governments around the world have made guarantees that they will purchase large quantities of successful vaccine doses. These guarantees, paired with funding for RD&D and manufacturing, gave firms the confidence to dedicate time and resources to an all-out development effort to commercialize lifesaving vaccines.

Such a procurement guarantee is known as an advance market commitment (AMC), and this model was first successfully demonstrated more than a decade ago. In 2007, five countries and the Bill and Melinda Gates Foundation funded the first AMC, under which manufacturers who could successfully develop and produce a pneumococcal vaccine appropriate for the developing world would be guaranteed to sell that vaccine at a pre-specified price. The donors raised $1.5 billion to fund the AMC, and it resulted in multiple firms developing and commercializing pneumococcal vaccines. The AMC offered those firms a top-up payment to supplement every discounted sale of the vaccine in developing countries. This spurred vaccine manufacturers to bring a product to emerging economies that they may not otherwise have commercialized.[31]

The degree to which governments are the dominant buyers of COVID-19 vaccines makes this a somewhat extreme case, but AMCs could be used to effectively spur the commercialization of clean energy technologies as well. One lesson from the vaccine examples is that great care must be taken to clearly specify performance requirements for a successful technology.[32] Doing so raises the chance that the technology can graduate from a policy-supported early market to supplying the broader needs of a self-sustaining commercial market. Another lesson is that AMCs are most effective when paired with coordinated funding for RD&D.[33] Otherwise, an AMC alone may only support the final stages of commercialization of a technology that has already reached relative maturity after years of development, and it may not be sufficient to spur firms to invest in earlier-stage research.

2. Milestone Payments for Commercial Spaceflight

Another remarkable technology achievement in 2020 was the first crewed mission to the International Space Station by a private company, SpaceX. That feat was made possible by the US government's use of a demand-pull innovation policy—milestone payments—that supported private companies in demonstrating a series of advances that culminated in a revolutionary technological capability.

In 2006, the National Aeronautics and Space Administration (NASA) launched the Commercial Orbital Transportation Services (COTS) program, a public-private collaboration to speed the development of cost-effective private-sector space launches of cargo and crew. The COTS program promised fixed-price payments—limiting the risk of government cost overruns—in return for private firms meeting particular milestones toward the ultimate goal of safely sending cargo and crew to the International Space Station. These payments

would still require private cost-sharing, but they would provide revenue certainty for companies that undertook the risk of technology development to meet the milestone performance specifications. The milestones included successfully designing and testing various subsystems, from engines to communications systems, and culminated in full-scale launch demonstrations.[34] Despite some delays, SpaceX ultimately met all of its milestones and demonstrated a world-leading new launch capability. It went on to earn lucrative contracts to ferry cargo and crew to space routinely on behalf of NASA (through COTS and other NASA programs), other government agencies, and a range of private companies.[35] In 2011, NASA estimated that if it had developed SpaceX's Falcon 9 rocket with traditional "cost-plus contracts and the usual oversight process called for by NASA procedures, the cost would have been almost $4 billion." By contrast, NASA spent only about a tenth of that amount investing in SpaceX as part of the COTS program.[36]

The success of the milestone-payment model offers several lessons for its application to clean energy technologies. First, payments for intermediate technological advances along the way to a final commercial product can induce firms to invest their own resources in earlier-stage technology development. This stepping-stone approach complements advance market commitments to procure a final product. Second, the innovative milestone scheme was possible because NASA harnessed "other transactions" authority from the 1958 Space Act to make agreements that were neither procurements nor grants and did not have to meet the more onerous requirements of the complete Federal Acquisition Regulations. Third, the COTS program closely involved private-sector advisors and was designed in a way to encourage public-private partnerships. For example, the program allowed private firms to retain full rights over their intellectual property, thereby encouraging them to invest alongside the federal government.[37]

3. Technical Standards and Private Buyer Consortia for Building Energy Efficiency

US federal demand-pull innovation policies have also achieved important successes in commercializing and scaling up clean energy technologies. One compelling case study is the DOE Advanced Rooftop Unit Challenge to induce the development of high-efficiency air conditioning units for commercial buildings. By working with private firms to design a stringent technical standard and organizing a consortium of private-sector buyers, the DOE succeeded in creating an early market for a new technology—all at low taxpayer expense.

Rooftop air conditioning units cool the majority of floor space in US commercial buildings and are often the largest source of energy consumption for a building.[38] To reduce energy consumption and emissions, in 2011 the DOE partnered with a range of private companies to develop a technical specification for an advanced rooftop air conditioning unit. This "RTU Challenge" set a target for manufacturers to develop a product that was 50 percent more efficient than the benchmark for commercial building air conditioners.[39] Multiple manufacturers developed products to meet the standard, and in 2013, the DOE launched a campaign to support the commercial scale-up of these high-efficiency air conditioners. By organizing a consortium of private-sector buyers to sign a letter of intent—including firms with large commercial real estate portfolios such as Walmart, McDonalds, and Target—the DOE sought to create a market for manufacturers' new products. By 2019, the campaign had resulted in the deployment of 160,000 high-efficiency rooftop air conditioners and a clear path to even more widespread private deployment of these products.[40] This was not a one-off success. The DOE repeatedly used this model of designing a technical standard for a novel product and then organizing private buyers to scale it up, such as through the Wireless

Metering Challenge for a low-cost technology to track building energy consumption.[41]

This model demonstrates the catalytic potential for demand-pull innovation policies to induce innovation and early deployment, even without substantial government expenditure. Policy makers can play a critical coordinating role, as these examples demonstrate. First, by setting a technical standard around which both producers and users of a new clean energy technology can align, the DOE set a clear target for technology development. Second, by lining up a consortium of private-sector buyers, the DOE provided market certainty for manufacturers to scale up production. In doing so, the DOE avoided the cost of large-scale public procurement—government costs were largely limited to supporting the handful of personnel who designed the technical standard, administered the campaign, and coordinated private-sector partners. However, without the right staff, resources, and a clear mission, the government will struggle to scale up isolated programs like these.

An Energy Technology Markets Office: Structure and Function

Government demand-pull innovation policies have succeeded across diverse fields. Recognizing the clear need for a coherent and ambitious approach to demand-pull innovation policy to accelerate the commercialization of clean energy technologies, the Biden administration should consider creating a new government office, the Energy Technology Markets Office (ETMO). The structure of this office should be tailored to its function: coordinating demand-pull innovation policy across the federal government in coordination with federal RD&D efforts and partnering closely with the private sector to create commercial markets for emerging clean energy technologies. The administration could consider alternative options, such as augmenting an existing, congressionally authorized office to lead the demand-pull innovation agenda.

If the administration opts to create a new office, housing it within the DOE could provide multiple benefits. First, the DOE is the primary federal agency for funding clean energy RD&D, so a DOE office focused on demand-pull innovation policies could build links to the RD&D funding offices to tailor policies to the priority technology areas receiving government investment. For example, the ETMO might work closely with the DOE's Advanced Research Projects Agency-Energy (ARPA-E) to create initial markets for technologies that receive technology-push funding through the ARPA-E "SCALEUP" program.[42] Second, DOE personnel have the required expertise across energy technologies and commercial markets to start staffing this new office. Third, the secretary of energy can immediately create this new office, though sustained funding may require congressional appropriations in coming years.

The recently passed Energy Act of 2020 directs the secretary of energy to develop the capabilities to design and administer demand-pull innovation policies, explicitly calling for streamlining prize competitions, authorizing milestone-based demonstration projects, and extending the DOE's flexible contracting authorities.[43] Creating a new office to lead these activities is an appropriate response to the directives in this legislation. Ideally, after the office's creation, Congress will authorize and fund it under its own line item. Two recent examples of DOE offices created by the secretary of energy using existing resources and personnel include the Office of Technology Transitions and the Office of Energy Policy and Systems Analysis. In the Energy Act of 2020, Congress formally authorized the Office of Technology Transitions, paving the way for it to receive its own appropriations line and simplify the office's funding.[44]

In fact, the newly authorized Office of Technology Transitions could itself be tasked with pursuing demand-pull innovation policies. Such policies fall within the office's mission to expand the commercial impact of the DOE's investments and commercialize technologies to reduce greenhouse gas emissions. This route takes advantage of the office's congressionally authorized status, easing the path for its budget to grow over time. On the other hand, folding the demand-pull innovation agenda into an existing office risks diluting the laser focus and high-level support needed to enact ambitious policies. Moreover, the Office of Technology Transitions has historically focused internally on DOE-funded technologies, whereas the administration's demand-pull innovation agenda should marshal a range of federal agencies to scale up clean energy technologies.

Because of the need to work with agencies across the federal government, it might seem attractive to create a new, standalone federal agency. Doing so, however, would require new statutory authorization and considerably more time. An ETMO housed within the DOE may be the best compromise between political feasibility and the need to elevate demand-pull innovation policies to the top of the clean energy policy agenda. To give the ETMO the authority and latitude to partner with other federal agencies, the director of the ETMO should report directly to the secretary of energy. External partnerships will be critical, particularly because the DOE's ability to raise funds for public procurement of clean energy technologies is limited. By contrast, agencies such as the Department of Defense are well equipped to launch procurement programs for innovative technologies. So, for example, ETMO could bring to bear its expertise on commercializing clean energy technologies to inform the military's design of a milestone-based contracting tool.

Bringing in the right personnel will be critical to the ETMO's success. Many of these personnel, with deep expertise in developing and scaling clean energy technologies, are already accessible at the DOE. Other federal agencies that will play an important role in commercializing clean energy technologies should detail employees to serve tours in the ETMO to facilitate cross-agency cooperation on designing demand-pull innovation policies. These agencies include the Department of Defense, the Department of Agriculture, NASA, the National Institute of Standards and Technology, and others. And to facilitate close collaboration with the private sector, the ETMO should explore utilizing existing DOE authorities to hire professionals with relevant expertise in investing, project finance, and procurement.

In coordination with the Biden administration's upcoming push to increase investment in clean energy RD&D, the ETMO should identify and prioritize technologies to commercialize in the near term. For example, it might prioritize long-duration energy storage, electrolyzers for hydrogen production, advanced renewables, carbon capture, and other emerging technologies that will be critical for decarbonization. For each technology, the ETMO should develop a strategy for commercial scale-up.

This will require the ETMO to be highly versatile and adaptable. Taking the example of long-duration storage, the ETMO might pursue multiple avenues to create early markets for promising technology options. In the electric power sector, utilities will benefit from technologies to integrate large quantities of renewable energy in the coming years, but on their own they are notoriously slow to adopt such technologies owing to risk aversion and suboptimal market signals.[45] To lower these barriers to adoption, the ETMO might seek to organize utilities around the country to set and harmonize technical standards for long-duration energy storage and help them design procurement processes that provide market certainty for firms developing storage solutions. The military may also benefit from long-

duration storage technologies to improve the resilience of renewably powered bases—thus, in meeting its own national security objectives, the Department of Defense might represent another early technology market. The ETMO could therefore partner with the department to design a prize competition, advance market commitment, or milestone-payment scheme to support the scale-up of long-duration storage solutions for advanced military microgrids.

The ETMO can serve as a resource for a range of partners. For example, private firms seeking to form buyers' consortia for new technologies may work with the ETMO to design the most effective vehicle. Federal agencies seeking to set up demand-pull innovation policies can look to ETMO professionals to understand the intricacies of federal contracting regulations and how to creatively design policies such as NASA's COTS program. Indeed, the Obama administration prepared a compendium of innovative government contracting processes, spanning challenge-based acquisitions, prizes, milestone-based competitions, rapid technology prototyping, and more.[46]

If the Biden administration opts to create an ETMO, it will need to carefully scope out its responsibilities and detail how it will work with the rest of the DOE and the federal government. Doing so will be essential to avoid confusion among different DOE offices and to ensure that other agencies have a single DOE point of contact when collaborating on demand-pull innovation policies. A well-conceived ETMO could lay the groundwork to rapidly scale a whole-of-government effort that uses existing authorities to support the commercialization of emerging technologies while avoiding bureaucratic obstacles and most efficiently using taxpayer funds.

Conclusion

Clean energy innovation is critical to the fight against climate change and to boosting US global economic competitiveness. The Biden administration's commitment to making a historic investment in clean energy RD&D is essential, and so are policies for large-scale deployment of clean energy, such as the ambitious suite of economywide standards and investments that the president-elect has proposed. In between such technology-push and mass deployment policies is a niche filled by "demand-pull innovation policies." These measures aim to create early markets for promising technologies, making the most of limited government spending and using existing statutory authorities. In recent years, demand-pull innovation policies have helped scale lifesaving drugs, underpinned commercial spaceflight, and brought new clean energy technologies to market. The Biden administration should consider immediately pursuing such policies—which could avoid contentious legislative processes—to scale and commercialize emerging clean energy technologies.

To coordinate the federal government's efforts on this front, the Biden administration should consider augmenting an existing office or creating a new one: the Energy Technology Markets Office. Such a new, high-level office within the Department of Energy could work across the federal government and with private partners to speed the commercialization of clean energy technologies by creating clear and significant market demand signals. Staffed by DOE experts, professionals with private-sector experience, and detailees from across the federal government, the ETMO could help agencies administer innovative demand-pull models and organize private firms to create early commercial markets for new technologies. Other federal agencies, such as the Department of Agriculture, could perhaps use the success of the ETMO as a template to create sister offices that focus on climate solutions outside the energy sector. By filling this important need—that of creating market certainty for the private sector

to scale up promising new products and services—the ETMO can turbocharge the Biden administration's plans to build advanced energy industries and speed deep decarbonization.

Notes

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