# Marist SV Aff – Holy Cross v1

## Contention 1: REM

#### This week’s acceleration of the trade war with China has exposed the need for UNCLOS. Jacob Nelly indicated this week that:

Jacob Nelly, 9-18-2018, "Rare earths and trade war: Trump exposes Achilles heel in raging tariff tussle with China," International Business Times, India Edition, https://www.ibtimes.co.in/rare-earths-trade-war-trump-exposes-achilles-heel-raging-tariff-tussle-china-780858, Date Accessed 9-19-2018 // JM

If there's one commodity that can puncture the wheels of Donald Trump's trade war juggernaut, it's the rare earths over which China has a brutal monopoly. Interestingly, Trump has exposed his Achilles heel even as he rolled out additional tariffs on Chinese goods worth $200 billion. The United States did not include rare earth elements in the latest list of goods imported from China that will bear additional levies, according to Reuters. The agency reported that rare earth metals and their compounds were included in a tariff list prepared by the U.S. Trade Representative (USTR) in July. However, they were omitted from the [final list published on Monday](https://www.ibtimes.co.in/trump-imposes-new-tariffs-200-billion-worth-chinese-goods-780812). It's not clear if China would use its rare earths monopoly as a bargaining chip with the US as the trade war worsens. Historically, China's rare earth policy has been a matter of concern for industrialised nations like Japan and the US, as well as for the European Union countries. It remains to be seen if the Chinese would retaliate and use rare earths as a strategic lever, Dylan Kelly, a resources analyst at brokerage CLSA in Sydney, told Reuters. "... obviously that's where a lot of investors have focused their attention," [he said](https://in.reuters.com/article/us-usa-trade-china-minerals/u-s-gives-rare-earths-reprieve-in-revised-200-billion-china-tariff-list-idINKCN1LY0QK?il=0). China controls more than 90 percent of the world's rare earth market, making advanced industrialized nations heavily dependent on it for the supply of these essential minerals. Technically viable alternatives to rare earth materials are currently not known. The US has rare earths reserves of more than a million tonnes but mining in the country has virtually stopped over the years over environmental and regulatory issues. Rare earths are indispensable for high-tech industries and are heavily in demand in defence systems, electric cars, wind generators, hard-disk drives, mobile communication, missile guidance and the like. [The 17 rare earth elements](https://www.ibtimes.com/there-way-fight-chinas-rare-earths-economic-warfare-248124) are lanthanum, cerium, praseodymium, neodymium, promethium, samarium, europium, gadolinium, terbium, dysprosium, holmium, erbium, thulium, ytterbium, lutetium, scandium and yttrium. The US has been mindful of its vulnerability on the rare earths front. The government last month banned the purchase of rare earth magnets from China for military and defence purposes. The move stemmed from the forethought that any Chinese retaliation on trade front could compromise the US defence interests.

#### There are two roadblocks to domestic REM investment in the status quo – the first is the permitting process. Adam Ellington wrote on yesterday that:

Adam Ellington & Stephen Lu, 9-28-2018, "Deep-Sea Mining for Rare-Earth Metals Looms, as Do Environmental Questions," No Publication, https://www.bna.com/deepsea-mining-rareearth-n73014482856/, Date Accessed 9-29-2018 // JM

On Sept. 17, United Nations negotiators met in New York to kick off a [two-year process](http://sdg.iisd.org/events/first-session-of-the-intergovernmental-conference-on-bbnj/) aimed at developing rules to protect the ocean from overexploitation. The U.N. Convention on the Law of the Sea (UNCLOS) already includes a mandate to regulate mineral-related activities, but environmental groups claim those rules don’t go far enough. “UNCLOS has a clear mandate to protect the marine environment from harmful effects. But in the case of mining we really don’t have a good understanding of what those measures are, or what constitutes harmful effects,” said Xiao Recio-Blanco, director of the Ocean Program at Environmental Law Institute, based in Washington. Recio-Blanco said he has confidence in the International Seabed Authority, which oversees mining in international waters, but seafloor surveys are just now beginning to reflect the true abundance of life in areas marked for mining. “It’s not that we want to close the entire sea off to mining,” he said, “but we need better science to translate that understanding into specific rules and thresholds for environmental impacts that would lead to a suspension of activities.” The seabed authority is accepting comments on [a draft plan](https://www.isa.org.jm/news/stakeholders-invited-comment-revised-draft-regulations-exploitation-mineral-resources-area) for seabed mining until Sept. 30. Its goal is to release final rules by 2020. To date, the authority has approved 29 exploration contracts in international waters. However, since the U.S. Senate never ratified UNCLOS, American companies aren’t legally permitted to apply for prospecting contracts in international waters. But that doesn’t preclude U.S. companies from conducting mining operations inside the country’s 200 nautical mile exclusive economic zone. “But that’s not really happening either,” said James Hein, a research geologist at the USGS’s Pacific Coastal and Marine Science Center in Santa Cruz, Calif. “Congress has been passing all of these [critical metals laws](https://www.congress.gov/bill/115th-congress/house-bill/1407/text), but they’re not doing the things they should be doing to make progress in the marine environment,” Hein told Bloomberg Environment. He blames Congress for failing to fund the deep-sea surveys necessary to locate mineral deposits. “We can estimate what should exist in our own EEZ, the ridges around the Mariana Trench are thought to have the best ferro-manganese crusts the world. And companies from China, Korea, Russia, Japan have all taken out prospecting contracts just outside our EEZ,” he said.

#### Fortunately, UNCLOS resolves this because Katherine Liljestrand explains in 2018 that as a non-member:

Katherine Liljestrand, 2-8-2018, "The Deep-Sea Reasons for the Accession of the United States to the 1982 Convention on the Law of the Sea," Georgetown Environmental Law Review, https://gelr.org/2018/02/08/the-deep-sea-reasons-for-the-accession-of-the-united-states-to-the-1982-convention-on-the-law-of-the-sea/, Date Accessed 9-17-2018 // JM

The 1982 Convention on the Law of the Sea is the world’s foremost international treaty with respect to the legal order for the global seas and oceans.[1] While most environmental issues covered by the United Nations Convention on the Law of the Sea (UNCLOS) have already been accepted by the United States as customary international law[2], there are two main environmental reasons why the United States should and needs to accede to the Convention with proper haste. Both of these environmental issues deal with the seabed and mineral resources in the deep sea. And while the Convention has already been signed by and transmitted to Congress by President Bill Clinton as of July of 1994[3], Congress has yet to vote on accession to the treaty.[4] The current Congress should strongly support the ascendance of the United States to UNCLOS and vote accordingly, as ascendance would put the United States in a more favorable position to influence and take part in both the present and the future of coastal shelf oil drilling and deep sea resource mining. The two main mechanisms of UNCLOS that deal with deep seabed issues are the Commission on the Limits of the Continental Shelf[5] and the Council of the International Seabed Authority.[6] While the United States remains a non-party to UNCLOS, access to these two bodies – and, subsequently, to the subject jurisdictions they cover – is denied. Firstly, the Commission on the Limits of the Continental Shelf[7] is the foremost international body which “consider[s] the data and other material submitted by coastal States concerning the outer limits of the continental shelf in areas where those limits extend beyond 200 nautical miles, and to make recommendations in accordance with article 76 . . . “[8] What this means is the Commission determines whether or not a country is able to claim its outer continental shelf (OCS) extends past the 200 nautical mile Exclusive Economic Zone (EEZ) thereby expanding its territorial rights to drill. As the United States is not currently a member of UNCLOS, the United States cannot currently claim any drilling rights over any potentially-extended continental shelf.[9] Also, as the United States is not on the Commission, the United States cannot nominate or elect experts to a seat on the Commission and thus has no say in the establishment of outer continental shelves for other countries[10], as when Russia submitted an overly expansive claim to its outer continental shelf.[11] The current administration seems to be moving forward with all hands on deck in regards to offshore oil drilling[12], so acceding to UNCLOS and nominating experts to the Commission could further those efforts. The United States needs to be on the Commission because its voice needs to be heard for the present and future of both our own extended continental shelf and the extended continental shelves of other countries. The second important environmentally-related mechanism the United States is missing out on is the Council of the International Seabed Authority and its unique process.[13] The International Seabed Authority is the primary body that deals with the Area.[14] The Area, as defined in Article I of UNCLOS, includes the seabed, ocean floor, and subsoil beyond the limits of national jurisdiction.[15] The International Seabed Authority is the international body that regulates and controls all mineral-related activities in the Area, and only parties to UNCLOS can sit on the Council.[16] The United States has a reserved, permanent spot on the Council due to having the largest economy at the time of UNCLOS’ ratification but is unable to take that spot unless it becomes a party to UNCLOS.[17] As of currently, the United States is missing out on partaking in the Authority’s defining of the future of seabed mineral mining. The International Seabed Authority issues permits to private parties – mainly companies – for the exploitation and mining of deep seabed minerals[18], such as the highly profitable polymetallic manganese nodules. It is the International Seabed Authority that determines how these permits are distributed and any restrictions on those with the permits.[19] In order for a private company to get a permit for deep sea mining, the company must be sponsored by a country to begin the application process with the International Seabed Authority. Thus [if we were to accede], United States companies [would] have no access to this process or the permits for deep sea mining. This hurts United States-based companies who could otherwise feasibly take part in the race for claiming highly valuable seabed minerals through excavation. While the United States did not deal with some of the original provisions – chiefly Article XI[20] – in the original Convention on Law of the Sea, these provisions were changed in 1994 through the Agreement on Implementation. The changes in the treaty were to the satisfaction of the United States, as President Clinton signed and transmitted the treaty to Congress as soon as the provisions in question were changed.[21] Congress should no longer delay voting in favor of the United States acceding to the United Nations Convention on the Law of the Sea. Today, the magnitude of the environmental issues relating to coastal shelf drilling and deep sea mining is great enough that it is imperative for Congress to actually initiate a vote and formally adopt the United Nations Convention on the Law of the Sea.

#### The second roadblock is failing to reach commercialization. David An explains in 2015 that:

David L. An, 2015, "Critical Rare Earths, National Security, and U.S.-China Interactions: A Portfolio Approach to Dysprosium Policy Design”, RAND Corporation, <http://www.dtic.mil/dtic/tr/fulltext/u2/a615998.pdf>, Date Accessed 8-21-2018 // JM

Contrary to the common perception, the chief deterrent to U.S. mining operations is not necessarily the strength of the environmental and labor protection laws. Most countries, including the U.S. and other developed economies, meet the environmental regulatory standards established by the World Bank. Rather, it is the endemic delays in mine permitting that is the “most significant risk to mining projects in the United States,” according to Behre Dolbear Group whose report ranked U.S. permitting delays second to last (right above Papau New Guinea) in a survey of 25 countries (Wyatt and McCurdy 2013). 106 The average time it takes to obtain mining permits in the U.S. is about seven to ten years. In contrast, Canada and Australia, both of which have similarly stringent environmental protection laws as the U.S., generally license mining operators within one or two years (Wyatt and McCurdy 2013 and Tanton 2013).107 Industry research faults overlapping regulatory bodies (local, state, and federal) that require sequential rather than concurrent process for obtaining licenses as one culprit in permitting delays (Tanton 2013). The competing and compounding jurisdictions create uncertainties regarding duplication and inconsistencies in regulatory enforcement, applications of environmental statutes, and zoning protection. These are cited as [another] top reasons that “mildly” or “strongly” deter U.S. mining investments when compared against its peer economies (South Africa, Australia, Canada, Greenland, and Sweden) that also have dysprosium (and other heavy rare earth) mining potentials (Figure 6.2) (Wilson and Cervantes 2013). Furthermore, prolific litigation against proposed mining developments also plays a large role in delaying mine developments (Tanton 2013). According to the USGS, of seventeen proposed mines between 2000 and 2009, about half were subject to lawsuits, six of which never reached commercialization (Figure 6.3) (Long et al. 2010).

#### Luckily, codification of UNCLOS solves this. Marta Kolcz-Ryan indicates in 2009 that:

Marta Kolcz-Ryan, University of Dayton, "An Arctic Race: How the United States' Failure to Ratify the Law of the Sea Convention Could Adversely Affect its Interests in the Arctic", 2009, accessed 8 July 2018, <https://www.udayton.edu/law/_resources/documents/law_review/anarctic_race.pdf>, Date Accessed 8-27-2018 // WS

Furthermore, experts often disagree on the existing norms of international law.122 The ambiguity exists because the international customary law that applies to ocean activities is derived from numerous conventions, judicial decisions, state practice, and interpretations by international organizations. The customary law is not universally accepted, and it changes over time based on state practice.123 To obtain financing and insurance and avoid litigation risk, “U.S. companies want the legal certainty that would be secured through the Convention’s procedures in order to engage in oil, gas, and mineral extraction on our extended continental shelf.”124 Also, American companies may not use customary law to claim the right to seabed mining. There is no customary practice for dealing with seabed mining, and such practice is necessary for the formation of customary law.

#### And put away your environment turns – the most recent evidence from yesterday show that commercialization is ready, safe and easy – Ellington furthers yesterday that:

Adam Ellington & Stephen Lu, 9-28-2018, "Deep-Sea Mining for Rare-Earth Metals Looms, as Do Environmental Questions," No Publication, https://www.bna.com/deepsea-mining-rareearth-n73014482856/, Date Accessed 9-29-2018 // JM

Once thought too expensive and too difficult, commercial scale mining of the deep sea is poised to become a reality as early as 2019. But scientists warn reaching rare minerals on and under the sea floor could cause irreversible damage to an environment that is still poorly understood. As new technologies come online, mining companies are probing depths from 5,000 to 16,000 feet to expose new deposits of manganese, copper, cobalt, and other rare-earth minerals necessary to build everything from smartphones to solar panels to electric cars. “People are making new discoveries almost every week; we’re nowhere near plateauing in our understanding of these deep-sea ecosystems,” said Lisa Levin, a biological oceanographer at the University of California-San Diego. Given how [little is known](https://www.eurekalert.org/pub_releases/2017-08/uoo-sgi081817.php) about deep-sea life, Levin told Bloomberg Environment that she feels mining should be delayed until regulators have a better grasp of biological consequences outside the mining footprint. “I just think we need to understand more about how these habitats interact, and how long they take to recover before we risk doing irreversible damage through mining.” ‘Plumes of Mud’ But compared to terrestrial mining, seafloor operations should have a smaller environmental footprint, potential ocean mining companies say. “These include effectively no mine tailings, minimal pre-stripping of sediment, no vegetation stripping or water catchment issues, no permanent on-site infrastructure such as roads, power lines, or buildings " said Noreen Dillane, a spokeswoman for Nautilus Minerals Inc. In Clarion-Clipperton Fracture Zone, a 1.7 million square mile deep-sea plain between Hawaii and Mexico, the U.S. Geological Survey estimates that there are about 21 billion metric tons of so-called “polymetallic nodules,” tennis-ball-sized chunks of ore high in manganese, nickel and copper, most of which are simply lying on the bottom of the Pacific. Mining these nodules should have a “light touch,” according to Greg Stone, chief ocean scientist for DeepGreen, a seafloor mining startup based in Vancouver. “A plume of fine sediment will be kicked up when a nodule is removed,” Stone told Bloomberg Environment. But the sediment resettles in a matter of days. Any creatures that live on the nodules will be killed, but overall the impacts aren’t expected to be significant, he said. “We don’t have all the answers yet, but at least we’re not talking about mountains full of arsenic and toxic waste and blasting,” he said. “We’re talking about plumes of mud.”

#### This means it’s only good news for REM mining. Two industries will be affected. First, the mapping industry. Mark Piesing wrote last week that:

Mark Piesing, 9-18-2018, "The ocean floor is Earth’s final frontier – meet the experts learning its secrets," inews.co.uk, https://inews.co.uk/news/environment/ocean-floor-research-maps-sir-ranulph-fiennes-seabed-exhibition/, Date Accessed 9-29-2018 // JM

There are a number of companies and organisations already in the running. Last year the Nippon Foundation-Gebco Seabed 2030 Project grabbed the headlines when it set itself the goal to produce the first definitive map of the world ocean floor by 2030. The Nippon Foundation is one of Japan’s largest foundations. Gebco (General Bathymetric Chart of the Oceans) is an international team of experts that has the authority to map the entire ocean. Some would say economics, in the form of commercial deep-sea mining, is the main driver to map the sea. More comprehensive maps are vital if rare metal alloys, oil and even diamonds are going to be mined there. “What matters are the reasons that you use the map rather than the mapping itself,” says Copley. “Yes, maps will help deep-sea mining, but the maps will also help us create marine protection zones.”

#### MPA’s are extremely advantageous as Luke Brander argues in 2015 that:

Luke Brander (Institute for Environmental Studies, VU University Amsterdam) Corinne Baulcomb (SRUC, Edinburgh) Jorge Amrit Cado van der Lelij (Independent Consultant, Amsterdam) Florian Eppink (Landcare Research New Zealand Limited, Auckland) Alistair McVittie (SRUC, Edinburgh) Ludo Nijsten (WWF-Netherlands, Zeist) Pieter van Beukering (Institute for Environmental Studies, VU University Amsterdam), May 2015, “The benefits to people of expanding Marine Protected Areas Final report,” <https://www.issuelab.org/resources/25951/25951.pdf?download=true>, Date Accessed 9-29-2018 // JM

This study develops a set of six mapped scenarios for the global expansion of MPAs. The scenarios vary along two dimensions: 1. the total coverage of MPAs as a proportion of EEZs, ABNJs and key marine habitats; 2. the characteristics of target locations in terms of biodiversity and extent of human impact. We conduct an economic assessment of these scenarios by estimating and comparing the costs and benefits of each scenario. Where feasible the analysis is conducted a high spatial resolution, allowing the estimated costs and benefits to reflect characteristics and context of each MPA. The results of this cost-benefit analysis show that all six scenarios are economically advisable (the ratios of benefits to costs are in the range 3.17 – 19.77). In the case of the scenario that achieves 10% coverage of total marine area and targets areas with high biodiversity and low human impact, each dollar invested [in mapping] yields a return of around 20 dollars in benefits. On this evidence the expansion of MPA coverage can be recommended from an economic perspective.

####  Second, the advanced manufacturing industry. John Pastor indicated in 2016 that:

John Pastor, 3-14-2016, "With rare earth minerals in short supply, researchers seek ways to extract them from coal," No Publication, https://vtnews.vt.edu/articles/2016/03/research-rareearth.html, Date Accessed 9-11-2018 // JM

 “The majority of rare earths is produced in China as byproducts,” said Yoon, who is the director of the Center for Advanced Separation Technologies at Virginia Tech. “With the recent closure of the rare earth mine in California, the U.S. relies more heavily on imports. It will be good for the country if we can develop an advanced separation technology to extract the critical materials from coal as byproducts, particularly the high-value rare earths [are] essential for advanced manufacturing industries.” The issue of domestic production affects matters concerning development of renewable energy resources and national security, the researchers said. “Domestic supply of rare earth materials is critical for the U.S. manufacturing industry,” said U.S. Rep. Morgan Griffith, who represents Virginia’s 9th district in the U.S. House of Representatives. “As the nation moves toward electric-drive vehicles, wind farming, and other sustainable energy measures, it is important to develop a reliable source of essential materials. In addition, we will develop new, cleaner applications for coal and coal byproducts to revitalize the mining industry.”

#### Ryan McConaghy indicates in 2011 that this sector is the:

Ryan McConaghy and Devon Swezey, October 2011, "Manufacturing Growth: Advanced Manufacturing and the Future of the American Economy," thebreakthrough.org/blog/BTI\_Third\_Way\_Idea\_Brief\_-\_Manufacturing\_Growth\_.pdf, Date Accessed 9-11-2018 // JM

However, despite these relative declines, manufacturing remains a sizeable contributor to our economy and directly employs over 11.5 million people.8 Paradoxically, even as manufacturing’s relative share of employment and GDP has decreased in recent decades, manufacturing has actually become even more important to sustaining American prosperity. Manufacturing is the most capital-intensive and productive sector of the economy, and it is key to developing and commercializing new technologies. Manufacturing also has the largest employment and output multipliers of any sector of the economy, creating many indirect jobs and making it a key catalyst of broad economic growth. Moreover, a healthy manufacturing sector is central to the United States’ ability to reduce its large and persistent trade deficit. The changes in the employment, industrial focus, and workforce skills associated with the new manufacturing should be viewed as the growing pains that accompany any significant metamorphosis. The most recent evolution in manufacturing has resulted in key differences between advanced and traditional activities. These differences have profound implications for the role of manufacturing in our economy and the design of national policy toward manufacturing. New manufacturing thrives on and drives innovation. Manufacturing is a core component of the nation’s innovation ecosystem. Firms engaged in manufacturing re-invest a significant portion of revenues in research and development (R&D). Overall, the manufacturing sector comprises two-thirds9 of industry investment in R&D and employs nearly 64% of the country’s scientists and engineers.10 Manufacturers also have unique opportunities to apply new technologies for specialized functions and achieve economies of scale at the plant or firm,11 making the return on manufacturing R&D significant. The transition to advanced manufacturing will enhance the sector’s role in fostering innovation and developing and commercializing new technologies. Advanced manufacturing industries, including semiconductors, computers, pharmaceuticals, clean energy technologies, and nanotechnology, play an outsized role in generating the new technologies, products, and processes that drive economic growth. Advanced manufacturing is also characterized by the rapid transfer of science and technology into manufacturing processes and products, which in and of itself drives innovation. The research-to-manufacturing process is cyclical, with multiple feedbacks between basic R&D, pre-competitive research, prototyping, product development, and manufacturing. This opens new possibilities for product development and manufacturing.12 Because of the technological complexity of many modern, science-based industries, technology development often requires interactions among experts from many different disciplines. It is therefore supported by “geographic clustering” of related manufacturing, supply chain, research, and educational facilities. 13 According to a 2004 report by President Bush’s Council of Advisors on Science and Technology (PCAST), “design, product development, and process evolution all benefit from proximity to manufacturing, so that new ideas can be tested and discussed with those working ‘on the ground.’”14 As a result, when a high-tech manufacturing cluster forms, it often attracts the co-location of R&D activities and helps sustain the global competitiveness of the entire region. This is why Intel recently decided to build a new state-ofthe- art R&D facility near Portland, Oregon where it has long had a high-tech manufacturing presence, as well as related silicon manufacturers, suppliers, and a high-skilled workforce.15

#### There are two impacts to this growth. First, it creates a sustainable future. Emily Holbrook writes last week that advanced manufacturing:

Emily Holbrook, 9-14-2018, "Report: Declining Costs and Technology Are Powering Renewable Energy Demand," No Publication, https://www.energymanagertoday.com/report-declining-costs-and-technology-are-powering-renewable-energy-demand-0178816/, Date Accessed 9-16-2018 // JM

Renewable energy sources, notably [solar](https://www.energymanagertoday.com/?s=solar) and wind, are reaching price and performance parity on and off the grid, finds a new Deloitte Global report, “[Global Renewable Energy Trends](https://www2.deloitte.com/global/en/pages/energy-and-resources/articles/global-renewable-energy-trends.html).” According to the report, three key enablers — price and performance parity, grid integration and technology — allow solar and wind power to compete with conventional sources on price, while matching their performance. As technologies such as blockchain, artificial intelligence (AI), and 3-D printing continue to advance the deployment of renewables, prices will likely continue to fall, and accessibility will improve, according to the report. “Demand for renewable energy sources has grown tremendously in recent years,” says Marlene Motyka, DeloitteUS and global renewable energy leader and principal, Deloitte Transactions and Business Analytics LLP. “Governments, communities, emerging markets, and corporations increasingly understand that renewables are sustainable and affordable, and they want them included in current and future procurement plans.” According to the report, longstanding obstacles to greater deployment of renewables have receded as a result of three key enablers: Reaching price and performance parity: The unsubsidized cost of solar and wind power has become comparable or cheaper than traditional sources in much of the world. New storage options are now making renewables more dispatchable — once an advantage of conventional sources. Cost-effective and reliable grid integration: Once seen as an obstacle, wind and solar power are now viewed as a solution to grid balancing. They have demonstrated an ability to strengthen grid resilience and reliability and provide essential grid services. Smart inverters and advanced controls have enabled wind and solar to provide grid reliability services related to frequency, voltage and ramping as well or better than other generation sources. When combined with smarter inverters, wind and solar can ramp up much faster than conventional plants, help stabilize the grid even after the sun sets and the wind stops, and, for Solar PV, show much higher response accuracy than any other source. The impact of technology: Technology is accelerating the deployment of renewables: automation and advanced manufacturing are improving [improves] the production and operation of renewables by reducing the costs and time of implementing renewable energy systems; AI can fine-tune weather forecasting, optimizing the use of renewable resources; [blockchain](https://www.energymanagertoday.com/us-senate-will-tackle-blockchains-energy-efficiency-or-lack-thereof-0178114/) can enable energy attribute certificate (EAC) markets to help resolve trust and bureaucratic hurdles; and advanced materials are transforming the materials of solar panels and wind turbines. Already among the cheapest energy sources globally, solar and wind have not even run the full course of their enabling trends yet. According to Deloitte, as costs continue to fall and accessibility increases, the demand for renewables is growing rapidly, driven by the following stakeholders: Smart renewable cities: Most of the world’s population now lives in growing cities, some of which have taken a [proactive “smart” approach](https://www.energymanagertoday.com/new-report-analyzes-evolution-of-smart-cities-0178739/) to managing their infrastructure with connected sensor technology and data analytics. The focus of more advanced smart cities is to enhance quality of life, competitiveness and sustainability. Solar and wind are at the intersection of these goals because they contribute to depollution, decarbonization and resilience while enabling clean electric mobility, economic empowermentandbusiness growth. Community energy: Building on the original trend toward “community solar,” the addition of storage and management systems give communities more flexibility when implementing renewables. On-grid communities can now be powered independently from the grid, and in off-grid areas, community-owned partnerships enable electrification and reinvestment of profits. Emerging markets: The cumulative capacity of emerging markets to develop renewable energy is on the verge of surpassing that of the developed world, as emerging markets have helped bring down the cost of renewables and are innovating in ways that benefit the developed world. Corporate involvement: Corporations are procuring renewables in new ways, with many large corporations pursuing Power Purchase Agreements (PPAs) and smaller corporations turning to aggregation. Furthermore, two-thirds of Fortune 100 companies currently have set renewable energy targets and are leading global corporate procurement, signaling an important commitment from the private sector. “Wide-scale integration of renewable energy sources is no longer a question of if, but when,” adds Motyka. “Countries such as China, the United States and Germany have already reached price parity for certain renewable sources. With prices continuing to drop, developed countries and emerging markets alike have the ability to integrate renewables into their grid systems to ensure competitive advantage.”

#### That’s important because the:

John Drexhage, June 2012, “The role of minerals and metals in a low carbon economy”, International Council on Mining & Metals, Date Accessed 9-20-18 // JM

The wide-scale introduction of [carbon capture system] CCS, as anticipated in IEA scenarios towards the middle of the 21st century, would similarly increase the demand for many metals. A 2011 study into metal requirements of low carbon energy by R. Kleijn et al estimates that applying CCS technology would increase metal requirements by 10–30% compared with the current electricity mix. This is due to the additional infrastructure needed to capture, transport and store CO2 emissions. The exact trajectory and proliferation of these different low carbon power generation and storage options is not yet fully known. However, according to expert assessments, their uptake is crucial for making the transition to a low carbon economy. Each option will have a different mineral and metals profile and further work is required to understand the potential implications on metals demand if these technologies are introduced at a large scale.

#### That’s huge as CCES indicates these systems:

Center for Climate and Energy Solutions, 2017, "Carbon Capture — Center for Climate and Energy Solutions," https://www.c2es.org/content/carbon-capture/, Date Accessed 9-18-2018 // WS

Carbon capture, use, and storage technologies can capture more than 90 percent of carbon dioxide (CO2) emissions from power plants and industrial facilities. Even as nations diversify their energy portfolios, fossil fuels are expected to meet a majority of the world’s energy demand for several decades. Accelerating deployment of carbon capture technology is essential to reduce emissions from these power plants, and from industrial plants like cement and steel manufacturing. More than half of the models cited in the [Intergovernmental Panel on Climate Change’s Fifth Assessment Report](https://www.ipcc.ch/pdf/assessment-report/ar5/wg3/ipcc_wg3_ar5_full.pdf) required carbon capture[ is also required to] for a goal of staying within 2 degrees Celsius of warming from pre-industrial days. For models without carbon capture, emissions reduction costs rose 138 percent.

#### Adam Vaughan terminalizes this in 2009 that:

Adam Vaughan, 5-12-2009, "Cleaner air from reduced emissions could save millions of lives, says report," Guardian, [https://www.theguardian.com/environment/2009/may/12/emissions-pollution-premature-deaths, Date Accessed 8-21-2018 // WS](https://www.theguardian.com/environment/2009/may/12/emissions-pollution-premature-deaths%2C%20Date%20Accessed%208-21-2018%20//%20WS)
Tackling climate change by cutting greenhouse gas emissions could save millions of lives because of the cleaner air that would result, according to a recent study. Researchers predict that by 2050, about 100 million premature deaths caused by respiratory health problems linked to air pollution could be avoided through measures such as low emission cars. The economic benefits of saving those lives in developing countries such as China and India could also strengthen the negotiating hand of the UK and Europe at a crucial UN climate summit in Copenhagen this December. Johannes Bollen, one of the authors of the report for the Netherlands Environment Agency, said the **[approximately] 100 million early deaths could be prevented by cutting global emissions by 50% by 2050[.]**,a target consistent with those being considered internationally. The reports warns that if governments continue with business-as-usual energy use, then population growth, ageing demographics and increased urbanisation will cause premature deaths from pollution to increase by 30% in OECD countries, and 100% outside the OECD. The study also has implications for which technologies are chosen to reduce CO2 and other greenhouse gases. The study points out that while carbon capture and storage technology can capture CO2, it does not usually trap other air pollutants. Last month, the energy and climate minister, Ed Miliband, put "clean coal" at the centre of UK energy policy by pledging no new coal-fired power stations would be built without at least partial CCS.

#### Second, it lowers pharmaceutical drug costs. Scott Gottlieb indicates in 2018:

Scott Gottlieb, 7-13-2018, "FDA Budget Matters: Investing in Advanced Domestic Manufacturing," No Publication, https://blogs.fda.gov/fdavoice/index.php/2018/07/fda-budget-matters-investing-in-advanced-domestic-manufacturing/, Date Accessed 9-16-2018 // JM

The U.S. is the current pioneer for advanced manufacturing. Our investments in educating engineers and establishing a research base for the development of domestic facilities will ensure that we maintain our lead in the world. Many U.S. universities have already established advanced manufacturing academic programs that train on these approaches. Some are funded through grants from the FDA that were authorized in 21st Century Cures. These approaches have also been applied with success to other fields, such electronic devices and chemical industries. Producing more drugs domestically doesn’t just mean more American jobs. It could also reduce import costs for manufacturers and increase security of our supply chain. Continuous manufacturing technologies could save 30 percent in manufacturing costs. This estimate does not include the savings from potential future technologies. That totals $60 billion per year in savings in the United States. This can help reduce drug costs. PCAST estimates that “Continuous manufacturing may reduce manufacturing costs, which currently consume as much as 27 percent of the revenue for many pharmaceutical companies, by up to 40 to 50 percent.” One example of promising investment in these technologies is recent efforts by General Electric to “launch prefabricated manufacturing units for producing virus-based gene and cell therapies, novel anti-cancer treatments and vaccines.” Innovations like these could make it more feasible for small, innovative biotech companies to enter the market and compete against larger pharmaceutical companies, especially for gene and cell-based cancers. This could provide a broader array of innovation, and infuse more competition into these promising therapeutic areas. The agility of continuous manufacturing platforms should ultimately reduce costs of drug manufacturing and could provide savings to our health system. But the efficient adoption of these approaches will require a paradigm change in the regulation of manufacturing. And that will require an investment to write new principles for how the FDA oversees these tasks. This is the opportunity before the FDA, and the heart of the proposal in the President’s budget.

#### Kevin Outterson concludes in 2015 that:

Kevin Outterson, 1-30-2015, "The Puzzle Of Antibiotic Innovation," No Publication, https://www.healthaffairs.org/do/10.1377/hblog20150203.044374/full/, Date Accessed 9-18-2018 // JM

Dame Sally Davies, the Chief Medical Officer of England, warns that we are approaching an [antibiotic apocalypse](http://www.theguardian.com/society/2013/jan/23/antibiotic-resistant-diseases-apocalyptic-threat). A former chief economist at Goldman Sachs [estimates](http://amr-review.org/sites/default/files/AMR%20Review%20Paper%20-%20Tackling%20a%20crisis%20for%20the%20health%20and%20wealth%20of%20nations_1.pdf) that unless dramatic action is taken now, antimicrobial resistance could kill 50 million people a year and cause $100 trillion in cumulative economic damages. In the US, dire warnings have issued from the [Centers for Disease Control and Prevention](http://www.cdc.gov/drugresistance/threat-report-2013/) (CDC), the [President’s Council of Advisors on Science and Technology,](http://www.whitehouse.gov/sites/default/files/microsites/ostp/PCAST/pcast_carb_report_sept2014.pdf) and the President himself through an Executive Order on [Combating Antibiotic-Resistant Bacteria](http://www.whitehouse.gov/the-press-office/2014/09/18/executive-order-combating-antibiotic-resistant-bacteria) in September 2014 (summary [here](http://theincidentaleconomist.com/wordpress/the-obama-plan-for-combatting-antibiotic-resistance-is-out/)). The President’s [new budget](http://www.whitehouse.gov/the-press-office/2015/01/27/fact-sheet-president-s-2016-budget-proposes-historic-investment-combat-a) asks for $1.2 billion to be spent on antibiotic resistance. But last week, the science press breathlessly celebrated the discovery of a new antibiotic, teixobactin, cultured from soil samples collected in a grassy field in Maine (the study was published in [Nature](http://www.nature.com/nature/journal/v517/n7535/full/nature14098.html)). Crisis over? Not so fast. Teixobactin has only been studied in mouse models, not humans. The point estimate failure rate for antibiotics from early discovery stage to actual drug approval for humans is 97 percent (only 3 percent survive – see the [Eastern Research Group, Inc. study](http://aspe.hhs.gov/sp/reports/2014/antibacterials/rpt_antibacterials.cfm), page 3-9). After approval, most antibiotics fail in the marketplace for commercial and safety reasons; antibiotics suffer [market withdrawals](http://www.ncbi.nlm.nih.gov/pubmed/24088160) at triple the rate of all other drugs. The Price-Volume Model But let’s assume that teixobactin makes it through 5-10 years of clinical trials and is approved by the Federal Drug Administration (FDA) with great fanfare. Hundreds of millions will have been invested in these clinical trials. How will the company see a profit on their investment? A [recent study](http://aspe.hhs.gov/sp/reports/2014/antibacterials/rpt_antibacterials.cfm)conducted by the Eastern Research Group for the US Government suggests the company will lose money, even on a “successful” antibiotic. Under the existing “price-volume” model, drug companies make money by selling drugs, either with high prices, high volumes, or both. The [October 2014](http://content.healthaffairs.org/content/33/10.toc) Health Affairs issue on specialty drugs highlighted many examples, including the new drugs for Hepatitis C. For antibiotics, the price-volume model is broken. For excellent clinical reasons, new antibiotics are adopted very slowly. Hospital stewardship programs rightly control the use of new drugs to delay resistance. This is good news for patients, but terrible news for the companies trying to sell an innovative new antibiotic. Imagine if the new iPhone 6 could not be sold until all of the existing iPhone models were completely exhausted first. Due to the threat of resistance, antibiotic innovation cannot be based on high volume of sales. As Scott Podolsky notes in his new book, [The Antibiotic Era](https://jhupbooks.press.jhu.edu/content/antibiotic-era), the US over marketed antibiotics in the 1950s and 1960s, leading to the crisis today. Looking Beyond High Prices High prices are also not a likely solution, as antibiotics are more substitutable than many drug classes, and many generic antibiotics remain effective competitors. Higher prices would also give companies an incentive to overmarket, while worsening access to these drugs for millions of patients around the world who need effective antibiotics. For all the concern about future deaths from resistance, it is clear that more people die today from susceptible bacterial infections than resistant ones, meaning that improving access will save more lives. In an [article](http://content.healthaffairs.org/content/34/2/277.abstract) published in this month’s Innovation issue of Health Affairs, my colleagues and I lay out alternatives to the price-volume model for antibiotic innovation. Fixing the business model is urgent if we want antibiotics to make it out of the lab and into the patients who need them.

# New Cards - Rebuild