Investing Across Sectors to Reduce Emissions

An Analysis of the National Climate Bank

Summary

The National Climate Bank Act of 2019 was introduced in the U.S. Senate on July 8. The bill would form an independent non-profit financial institution called the National Climate Bank (Climate Bank). This institution would be capitalized with $35 billion of federal funds, and charged with raising and deploying capital in partnership with the private sector in order to maximize greenhouse gas (GHG) emissions reductions.

The bill establishes divisions within the Climate Bank with distinct purposes, and it gives the Climate Bank broad authority to support projects in many sectors.

While the bill names a set of eligible project types, it does not specify the extent to which the Climate Bank must invest in particular sectors or project types, nor does it preclude the re-evaluation of its investments over time. The bill also does not specify return requirements or other required metrics for its portfolio. Rather, it establishes a Board of Directors, a set of key priorities, and relevant mechanisms for oversight. This gives the institution the flexibility to conduct new analysis to guide its investments, and to adapt to changing conditions over the course of its 30-year charter. At the same time, its foundational priorities will remain constant.

The overarching priority of the Climate Bank is to maximize greenhouse gas reductions per public dollar, while reducing energy costs to consumers. Among projects that cost-effectively reduce greenhouse gases, the Climate Bank is empowered to prioritize projects that provide economic benefits to underserved communities, rural communities, and communities of color.

Within the scope of these priorities and provisions, the Climate Bank's work can be understood in terms of a few major categories:

Directly financing projects that reduce greenhouse gases.

This is a large category that would encompass investments in solar, wind, efficiency, storage, transmission, transportation, agriculture, and more.

Supporting state and local Green Banks.

This includes directly capitalizing state and local Green Banks, enabling them to finance distributed or local projects to reduce greenhouse gases. It also includes technical assistance to start up new state and local Green Banks where they do not currently exist.

Purchasing additional greenhouse gas reductions at lowest cost.

The Cash for Carbon program falls under this umbrella, whereby the Climate Bank is authorized to incentivize the retirement of coal facilities and purchase coal reserves. Retired fossil-fuel power would be replaced by cheaper renewable power, lowering consumer costs. Certain forestry and afforestation projects could also fall into this category, depending on the types of projects selected.

Investing in communities to ensure a just transition.

> As part of the Cash for Carbon program, the Climate Bank is authorized to directly invest in the communities where fossil fuel-based power plants and facilities are closed. More broadly, the Climate Bank is also empowered to prioritize projects that benefit rural communities, low- and moderate-income communities, and communities of color. This will help ensure sustained economic growth, new job training and healthy communities running on clean energy.

Each of these categories cuts across economic sectors, which is consistent with research underscoring the fact that deep decarbonization will require many sectors to "do their share" in reducing economy-wide emissions in the US.[1] For example, decarbonization of the power sector must be accompanied by fuel-switching to convert fossil-fueled activities like transportation and heating to electric technologies.

Quantifying the National Climate Bank's direct contribution to decarbonization in each of these categories is outside the scope of this paper, and could be a topic for future research. As an initial exploration, this paper seeks to examine the sectors in which the Climate Bank may invest and the types of projects which it could finance. Taken together, the Climate Bank's investments could have significant impact towards economy-wide decarbonization.

Figure 1: US GHG Emissions by Sector[2]

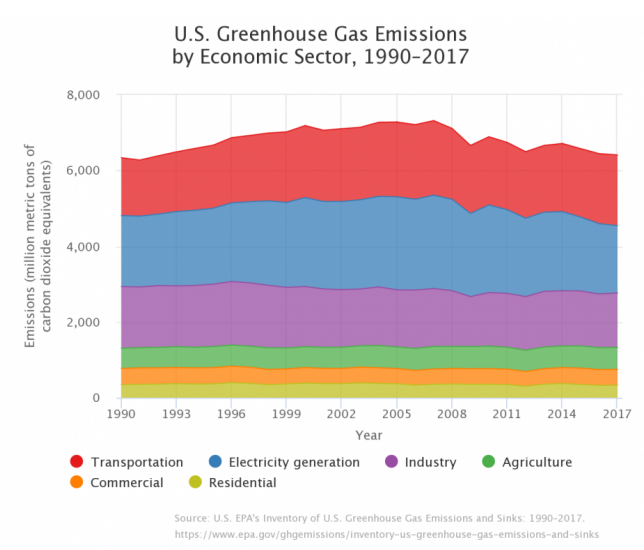
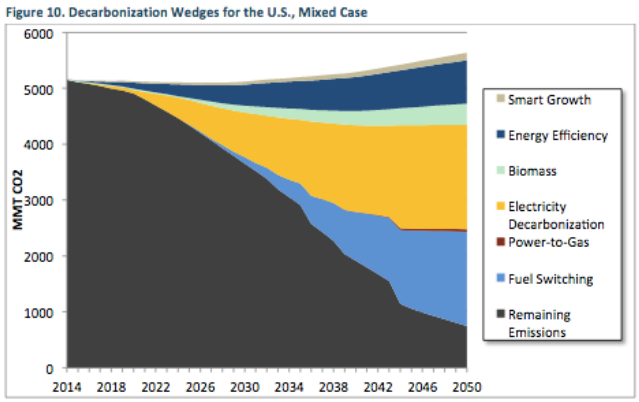


Figure 2: Pathways to Deep Decarbonization[3]



[1] "Pathways to Deep Decarbonization in the United States: Technical Report." Deep Decarbonization Pathways Project. November 2015.

[2] "Inventory of U.S. Greenhouse Gas Emissions and Sinks." EPA. Updated April 2019. Accessed Sept. 2019.

[3] "Pathways to Deep Decarbonization in the United States: Technical Report." Deep Decarbonization Pathways Project. November 2015. Pg. 23.

Direct Financing to Reduce GHG Emissions

Renewable Energy Generation

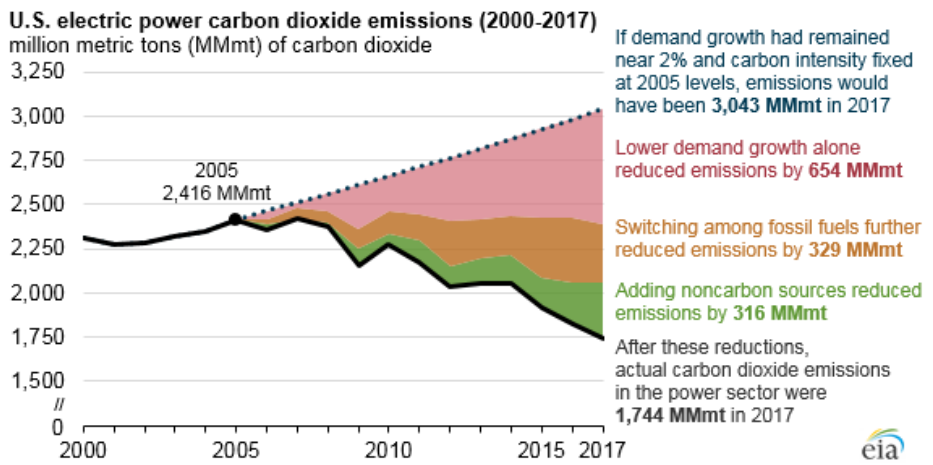
The Climate Bank will be authorized to finance a wide array of utility-scale renewable energy generation technologies, including solar PV, wind, geothermal and others. Emissions from the U.S. power sector declined 28% from 2005 to 2017, thanks in a large part to increases in renewable energy generation and improvements in energy efficiency.[4] However electric power generation still accounts for 28% of U.S. GHG emissions as of 2017.[5]

New capacity needs are already increasingly filled by clean energy, with EIA reporting that wind and solar make up 64% of planned capacity additions in 2019. At the same time, new natural gas is still being constructed despite increasing indications of stranded asset risks to these facilities.[7] Moving forward, more aggressive measures will be needed to complete the decarbonization of the power sector. Not only will renewables need to meet new demand, but they must become competitive with existing fossil-fueled generation in order to help accelerate the retirement of these facilities.

Low-cost financing from the Climate Bank can help increase the competitiveness of renewable energy resources in a wider range of markets sectors and geographic areas. Studies have shown that capital costs can have a significant impact on the delivered cost of electricity from clean energy projects, and ultimately on the uptake of clean energy.[8] In places where projects aren't viable today due to less favorable policy incentives or market conditions at the state level, the Climate Bank can reduce project costs and put renewables on a level footing with grid power by co-investing alongside private capital.

The Climate Bank can also help to expand into markets where resource availability is the

Figure 3: U.S. Power Generation CO_2 Emissions[6]



[4] "Carbon dioxide emissions from the US power sector have declined 28% since 2005." EIA Today in Energy. Oct. 29, 2018.
[5] "Inventory of U.S. Greenhouse Gas Emissions and Sinks." EPA. Updated April 2019. Accessed Sept. 2019.
[6] Carbon dioxide emissions from the US power sector have declined 28% since 2005." EIA Today in Energy. Oct. 29, 2018.
[7] "The Growing Market for Clean Energy Portfolios." RMI. Sept. 2019.
[8] "Adverse effects of rising interest rates on sustainable energy transitions." Nature Sustainability. Sept. 9, 2019.

limiting factor. By blending its capital alongside private investment, the Climate Bank lowers the total return requirement of the project, thus also lowering the capacity factor that is needed to build a viable project. Suddenly whole new geographies with less than ideal wind or solar resources become viable for development.

The Climate Bank can further use its financing to more deeply penetrate existing markets. Projects that are small in size, use multiple technologies, and have varied or unobservable credit quality are chronically underinvested in across the U.S., even though on paper they are economically viable. The Climate Bank can help address this problem by aggregating and warehousing these small projects so they can achieve the scale and diversity of risk that is attractive and familiar to private capital providers.

Transmission, Distribution, and Storage

Construction of a cleaner and more resilient grid will require investment in new high-voltage, long-distance transmission lines, local distribution systems for micro-grid applications, and a broad deployment of energy storage. As renewable energy increases as a percentage of the energy mix, these technologies become increasingly essential to maintain grid reliability and enable the successful integration of renewable energy.

Transmission is necessary to carry clean electricity from where it is produced to where it is consumed. This is important because the regions that are most conducive to large-scale wind and solar generation are often not situated close to major electricity load centers. Transmission bottlenecks are increasingly becoming an issue preventing cost-effective renewable resources from being fully used,[9] and major transmission projects have run into repeated roadblocks. For example, the proposed Grain Belt Express transmission line would move up to 4,000 megawatts of power from wind-rich west Kansas to load centers further east.[10]

There are have also been notable transmission success stories. In Texas, the state designated Competitive Renewable Energy Zones (CREZ), committed $7 billion to deliver energy from windy pastures to major cities. The project helped contribute to the rapid growth of wind energy in Texas, which now has the most installed wind capacity of any state.[11] Utility Dive quotes state Sen. Troy Fraser on the topic of the new transmission lines, saying: "There were two things that drove the market, the federal subsidy and what we did to build the CREZ line… It was basically build it and they will come. And they came in droves."[12]

The Climate Bank could help facilitate the construction of new transmission by providing technical assistance and reducing the "soft costs" of coordinating across a wide region, in addition to co-investing in transmission projects. The Climate Bank could also finance ancillary services for these transmission projects.

Grid issues also arise from the intermittency of wind and solar power. The timing of greatest power availability in a given location may not always match the time of greatest demand. Transmission and energy storage can both play a role in balancing generation and load, "smoothing out" local peaks and valleys and connecting excess generation at one place and time to a spike in load in another.

Advanced energy storage technology, particularly lithium ion-based batteries have fallen dramatically in price, and quickly. The

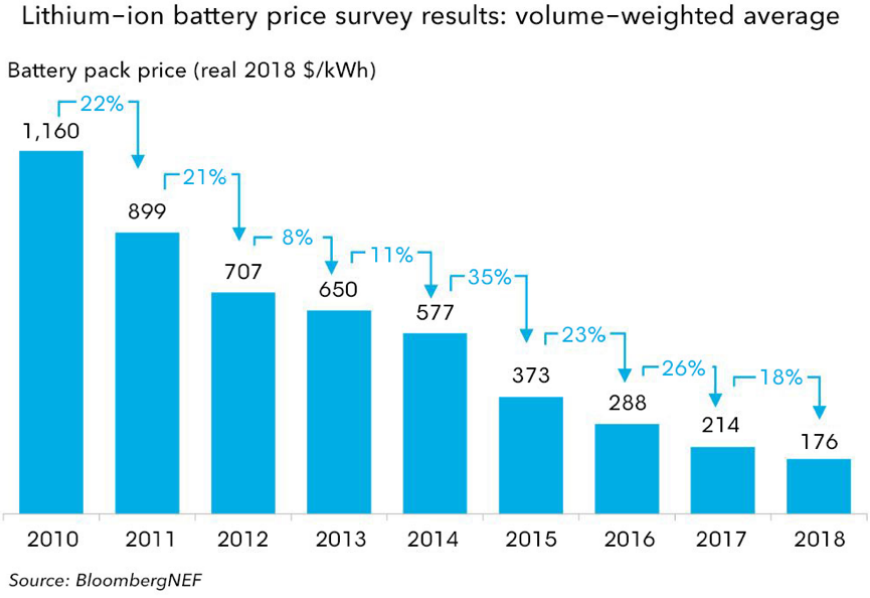
[9] "New Transmission Lines Required to Avoid Curtailment." Wind Power Monthly. Jan. 11, 2017.
[10] "Property Question Prompts Latest Challenge to Grain Belt Express." Energy News Network. Sept. 5, 2019.
[11] "Texas ranks first in US-installed wind capacity and number of turbines." EIA Today in Energy. July 31, 2019.
[12] "'Mission Accomplished?' Inside the Battle over Texas Renewable Energy Incentives." Utility Dive. Apr. 22, 2015.

volume weighted average cost of a battery pack fell by 85% from 2010 to 2018.[13] This technology is now being deployed commercially at the utility-scale so it can be paired with renewable power.

However, rapid deployment across multiple applications will warrant significant new investment from the Climate Bank, which can help to overcome investor cautiousness based on unfamiliarity with "first-in-kind" projects. Risk mitigation techniques like loan loss reserves, long-term financing, and innovative underwriting structures to properly account for the full set of storage value streams are all potential Climate Bank tools to support storage deployment.

Batteries aren't the only option for long-term, utility-scale energy storage. Other technologies remain in development, including ideas like gravity storage. However, projects at the early stages of development are focused on securing research and development funding and on venture capital, rather than conventional project finance. The Climate Bank would be able to step in at a later stage and help these new technologies scale up.

Figure 2: Lithium-Ion Battery Price from 2010-2018[14]

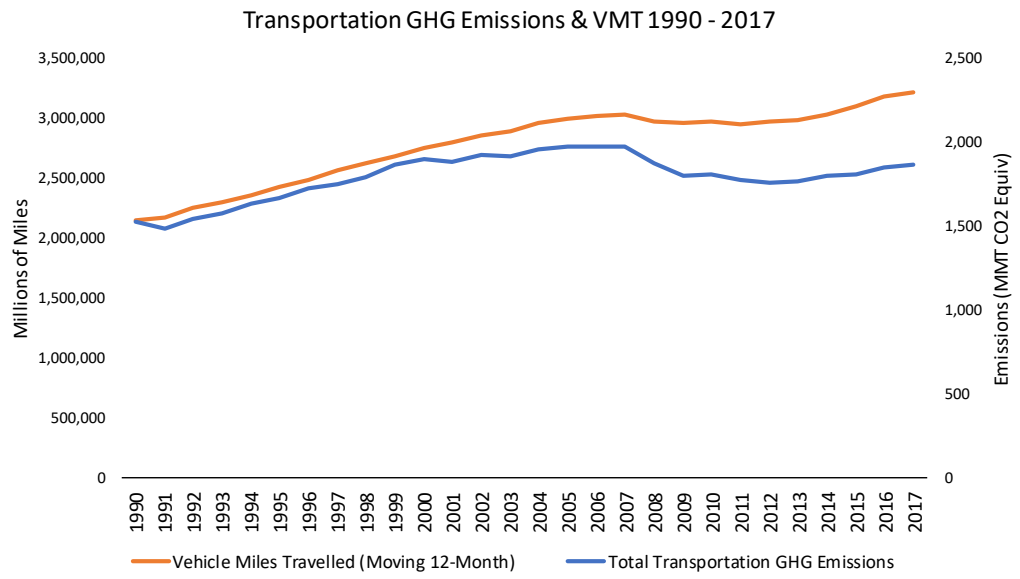


Clean Transportation

Transportation is America's largest source of GHG emissions, accounting for 29% of the national total.[15] These emissions are tightly linked to vehicle miles travelled (VMT) and the associated gasoline use in internal combustion engines (ICE).

[13] "A Behind-the-Scenes Take on Lithium Ion Battery Prices." BNEF. March 5, 2019.
[14] "A Behind-the-Scenes Take on Lithium Ion Battery Prices." BNEF. March 5, 2019.
[15] "Inventory of U.S. Greenhouse Gas Emissions and Sinks." EPA. Updated April 2019. Accessed Sept. 2019.

Figure 3: U.S. Transportation GHG Emissions and Vehicle Miles Travelled[16]



In the chart above, emissions have slowly begun decoupling from VMT, due to the increased fuel-efficiency of cars over time.[16] This is a positive trend, but decarbonizing the transportation sector in line with economy-wide climate goals will require a much faster and more complete approach.

Reducing and eliminating these emissions at a faster rate will require substituting fossil-fueled VMT for VMT from alternatives like electric vehicles (EVs) and even hydrogen-powered vehicles. But current market conditions present obstacles to the adoption of electric vehicles and transportation infrastructure.

EV prices have fallen significantly since mass market introduction in recent years, but they are still generally more expensive than the equivalent internal combustion engine vehicle. The economics of fast-charging infrastructure (EVSE) are also marginal, with revenue generated purely based on the sales of electricity unlikely to generate attractive returns for private capital (though new business models such as advertising-based models show promise). A recent study of direct current fast charging (DCFC) infrastructure found that, under today's economic conditions and utility rates, nearly all DCFC stations lose money.[17] Increased EV traffic would help the stations become profitable, but a chicken-or-egg problem exists where increased density of charging stations is necessary to spur EV adoption.

A Climate Bank can inject critical capital, scale and willingness to experiment into this ecosystem. The economic viability and attractiveness of EVs is closely linked to the presence of a charging station infrastructure and

[16] "Greenhouse Gas Inventory Data Explorer: US Greenhouse Gas Emissions from the Transportation Sector 1990-2017." EPA. Accessed Sept. 2019.

"Moving 12-Month Total Vehicle Miles Traveled." Federal Reserve Bank of St. Louis. Accessed Sept. 2019.

[17] "'Nearly all' high-voltage EV charging stations lose money: Report." Utility Dive. Aug. 22, 2019.

vice versa. The Climate Bank will be uniquely positioned to consider holistic solutions that can stimulate growth in both EVs and charging infrastructure simultaneously.

In addition to personal electric vehicles and their infrastructure, the Climate Bank is also authorized to invest in public transit. Creative solutions are being pioneered in this area at the local level. For example, a new program in Virginia managed through Dominion would allow schools to apply for electric school buses.[18] The utility would pay for the difference between the electric school bus and a conventional diesel bus, and install charging stations for the buses. In return, the utility would be able to use the buses as grid-scale storage when not in use transporting students, reducing the costs of balancing supply and demand across the grid.

In New York City, the New York Green Bank has facilitated an investment in a different type of public transportation: the Citibike bikeshare system. The bikeshare operator received nearly $50 million in two separate loan products from the New York Green Bank, which will fund the installation of nearly 2,000 bikes in low- to moderate-income neighborhoods.[19] Monthly operating reports find that the bikeshare system offsets more than a ton of carbon dioxide per month when usage is high.[20]

Working with state and local Green Banks, the Climate Bank could help facilitate this type of creative deal-making in other areas, and provide low-cost financing for the up-front investment. For more on how the Climate Bank would capitalize state and local Green Banks, see the section on state and local institutions.

Industrial Decarbonization

In 2017, direct emissions from the industrial sector made up 22% of U.S. GHG emissions.[21] Industrial processes like manufacturing of cement, steel and ammonia are energy- and emissions-intensive, and are also closely linked to economic growth. Emissions in this sector are attributable to a several factors, including carbon-based feedstock, burning fuel to generate very high temperatures as part of manufacturing processes, and on-site power generation. On-site combustion of fossil fuels for heat and power make up the largest share of the sector's direct emissions.[22] The sector also generates "indirect" emissions from the use of electricity generated off-site.

The industrial sector presents special challenges to decarbonization. For the many industrial products that are commodities, the sector can be highly sensitive to cost. Industrial infrastructure is long-lived, and few alternatives currently exist either for the manufacturing processes themselves, or for the substitution of different products on the part of the end-users.[23]

Decarbonizing this sector will require a combination of solutions, including renewable power generation, fuel-switching, the use of carbon capture technologies, and other solutions.[24] Some progress in this area will likely need to be made at the research and development

[18] "Electric School Buses: FAQs." Dominion Energy.
[19] "Governor Cuomo Announces Major Milestone Reached by NY Green Bank with $2.7 Million in Profits." New York Green Bank. June 22, 2017.
[20] "Citibike Monthly Operating Reports." Citibike. Accessed Sept. 2019.
[21] "Inventory of U.S. Greenhouse Gas Emissions and Sinks." EPA. Updated April 2019. Accessed Sept. 2019.
[22] "Decarbonizing U.S. Industry." C2ES. July 2019.
[23] "Challenges and Solutions for U.S. Industrial Decarbonization." Testimony by Dr. Julio Friedman before the House Committee on Energy and Commerce. Via SIPA. Sept. 18, 2019.
[24] "Challenges and Solutions for U.S. Industrial Decarbonization." Testimony by Dr. Julio Friedman before the House Committee on Energy and Commerce. Via SIPA. Sept. 18, 2019.

stage. As mentioned in a previous section, Climate Bank is not designed to provide R&D funding or venture capital, so investment at these early stages may be outside the scope of the Climate Bank's portfolio. However, as new technologies begin to scale up and be commercialized, the Climate Bank would be able to play a larger role.

The Climate Bank may also be able to play an immediate role in financing technologies like industrial energy efficiency, including combined heat and power, that have the potential to generate economic savings for a facility at the same time as greenhouse gas reductions.

Combined heat and power systems generate power on-site for large power users, and capture the heat emitted as a by-product of power generation for other uses. This can reach 80% efficiency, compared to 45% efficiency for power generation alone.[25] A 2016 DOE study estimated that more than 240 GW of technical potential exists across all CHP categories.[26] However, analysis from C2ES found that adoption of combined heat and power systems has stalled in recent years due to high capital costs, technical complexity, and policy changes.[27] Financial involvement from the Climate Bank could bring capital costs down for these solutions and help increase the uptake of combined heat and power and other efficient technologies.

Energy Efficiency and Demand Response

As shown in Charts 2 and 3, energy efficiency has played an important role in the GHG reductions that the U.S. has achieved thus far, and additional increases in efficiency will be needed to contribute to a deep decarbonization scenario. Energy efficiency encompasses a diverse range of technologies that allow customers to reduce their power demand, while still getting the same value out of the power they use.

A comprehensive energy efficiency retrofit to a commercial building might include efficient LED lighting, upgrades to the HVAC system, the addition of insulation to a building's walls, windows, or roof, and occupancy controls that turn lighting and other systems off when not in use. These improvements lower the user's energy bills, as well as avoiding the GHG emissions associated with the power they don't consume.

Energy efficiency can also provide important benefits to the grid as a whole. By reducing power demand, the grid can avoid the need for new power generation and transmission infrastructure, for which all users across the grid would otherwise bear the cost.

These benefits become even greater when coupled with demand response, which focuses specifically on reducing demand at peak times. Demand response programs often involve voluntary participation by users of large quantities of power, which can include commercial and industrial customers. These customers offer to modify their power usage at peak times when the grid is stressed, and receive a benefit in return from the utility, often in the form of a monthly payment. This can be a way for the utility to avoid constructing new "peaking

[25] "Combined Heat and Power: A Sleeping Giant May be Waking." POWER Magazine. March 1, 2019.

[26] "Combined Heat and Power: A Sleeping Giant May be Waking." POWER Magazine. March 1, 2019.

[27] "Decarbonizing U.S. Industry." C2ES. July 2019.

plants" which only run at times of extremely high demand.

Paying customers to reduce their usage at key times, and assisting them to become more energy-efficient across the board, can be cheaper than building an entirely new substation or peaking facility.

With the exception of the largest-scale commercial or industrial projects, the Climate Bank's role in financing energy efficiency and demand response would most likely be through capitalization of state and local Green Banks. These local institutions are a better fit for the distributed and local nature of most smaller-scale energy efficiency projects, and would have comprehensive knowledge of local markets and regulations, as well as relevant market participants. For more on how the Climate Bank would capitalize state and local Green Banks, see the section on state and local institutions.

Agriculture Projects and Forestry

As shown in Figure 1, emissions from agriculture make up a significant minority of U.S. greenhouse gas emissions, at 9% of total emissions. At the same time, land-use change and forestry represents a net carbon sink, offsetting approximately 11% of U.S. greenhouse gas emissions across sectors.[28] The Climate Bank's involvement in the agriculture and forestry sectors will seek to find ways to reduce agricultural emissions and boost the potential of forests to serve as carbon sinks.

Existing programs and efforts in these areas generally focus on a few avenues for change. In the area of agricultural emissions, most emissions come in the form of methane or nitrous oxide rather than carbon dioxide. These come from sources including fertilizers applied to soils, manure management, and fuel use by farmers.[29]

Improved crop management practices can lower greenhouse gas emissions from agriculture without reducing yields. Planting crops together rather than in monoculture, reducing the tilling of soil, and rotating crops can all help to reduce a farm's carbon footprint.[30] For animal agriculture, improved manure management practices like the use of digesters can capture emissions from waste.

The Climate Bank's involvement has the potential to improve the economics of these interventions. For example, in the case of methane digesters, farmers consider the potential revenue that the digester can generate.[31] Digesters can be used to produce biofuels, or to capture methane gas that is then burned to generate electricity. Net metering rules allow this power to be sold to the grid, and in some cases local renewable energy credits or the sale of carbon offsets also provide a source of revenue. Low-cost financing from the Climate Bank or via a local Green Bank could make the difference to a farmer's ability to invest in these technologies.

In the area of forestry, emissions reductions primarily come from preventing the deforestation of existing forests and improving forest management practices. Forests inherently sequester carbon as they grow, so with effective management, forests can be a significant carbon sink.

Revenue from forestry projects comes from the sale of forest products, and from carbon offset credits and incentives in cases where they apply. There are a few ways that forest products can be used commercially which still provide carbon

[28] "Inventory of U.S. Greenhouse Gas Emissions and Sinks." EPA. Updated April 2019. Accessed Sept. 2019.
[29] "Everything you need to know about agricultural emissions." WRI. May 29, 2014.
[30] "Farming tactics to reduce the carbon footprint of crop cultivation in semiarid areas: a review." Agronomy for Sustainable Development. December 2016.
[31] "Weighing the Pros and Cons of Methane Digesters." National Hog Farmer. Sept. 18, 2019.

emission benefits. These include the use of woody biomass for residential heating as a replacement for oil and gas, and the use of high-quality solid wood in building applications that maintain long-term carbon sequestration.

Forestry presents challenges to the Climate Bank's potential involvement due to the long-term time horizon for forestry projects. A forestry investment can take 45 to 80 years for trees to become mature enough to harvest,[32] and the Climate Bank's chartered lifespan is just 30 years long. Its involvement in these types of projects may be limited to "purchasing" GHG reductions in the form of grants or incentives rather than providing financing. However, the Climate Bank's Board should also work creatively to investigate new ways to finance forestry projects.

Climate-Resilient Infrastructure

The Climate Bank Act authorizes the Climate Bank to finance "climate resilience measures." This is potentially an incredibly wide bucket of activity, which could theoretically encompass projects as diverse as storm walls around Manhattan, and micro-gridding critical infrastructure to allow for baseline levels of safety and security in communities. Specific investment decisions will need be left to the Board of Directors, but their decisions will be informed by the Climate Bank's stated priorities and mission.

At the top of the Climate Bank's list of priorities is maximizing the reduction of greenhouse gases. Not all resilience projects necessarily accomplish this. So, one possible way to understand the Climate Bank's involvement with resilience is as consideration that informs investments in the categories discussed above. If the Climate Bank invests in utility-scale transmission or generation infrastructure, it should be built in a way that is resilient to climate impacts. Smaller projects like energy efficiency upgrades to individual homes or buildings could be bundled with resilience measures.

State and local Green Banks have begun to set examples for what this could look like. The Florida Energy & Solar Loan Fund (SELF) has found that it can finance the construction of new roofs on Florida homes, and that the resulting savings in home insurance premiums are sufficient to repay the loan. Resilience upgrades are often combined with energy efficiency upgrades that mean that the project as a whole generates GHG reductions. This kind of creative financing will need to be explored and potentially applied to a wide set of projects that improve America's ability to withstand the effects of climate change.

[32] "The Forest Landowner's Guide to the Federal Income Tax: Chapter 2: Timber Investment Considerations." National Timber Tax Website. Accessed Sept. 2019.

Supporting State and Local Green Bank Financing

In addition to directly financing clean energy and GHG emissions reduction projects, the Climate Bank will support the growth and investment activity of existing state and local Green Bank institutions across the United States.

A clear role exists for these state and local institutions, distinct from the investment role of the National Climate Bank. Energy markets, and electricity markets in particular, are regulated at the state level. That means that prices, restrictions, policies, subsidies, utility structure, emissions goals and more are set within each state and can vary widely across them. The clean energy market participants in each state also tend to be localized. Contractors, project developers and other participants build their base of business in large part based on the market conditions set by each state.

These diverse conditions mean that project types like distributed energy, community solar, or commercial or residential energy efficiency are better served by state and local Green Banks, where financing can be tailored to local needs.

The National Climate Bank Act specifies that the Climate Bank will be empowered to fund state and local institutions, and that it will contain a start-up division to help establish new state and local Green Banks. It does not contain further details about the flow of funds, but based on the relevant considerations in play, it is possible to infer a likely strategy for the Climate Bank.

Start-Up Division

The Start-Up Division team will be able to provide two key forms of support: technical assistance to guide the formation and launch process, and start-up funding.

Technical assistance has proven to be a key ingredient in successful Green Bank formation, and those locations that want a Green Bank will be able to receive that assistance at no cost from the Climate Bank. This removes a significant barrier to growth in the Green Bank ecosystem. This technical assistance would likely include market evaluation, governance assistance, product design and implementation, organization formation, hiring and business plans, and launch support to ensure a Green Bank can be formed quickly, while still suited to local conditions.

The other form of support provided by the Start-Up Division will be funding that the new Green Bank can use to start its operations. The amount will be scaled to meet the needs of the market and the specific business plan of the Green Bank, and will likely require some amount of matching funds. A realistic model would be to offer three years of operating funds, with the expectation that the Green Bank will be able to reach financial self-sustainability within three years. At that point, the revenue generated by the sub-national Green Bank in the form of interest payments and fees on from its operations should meet or exceed its operating revenues.

Capitalizing Sub-National Green Banks

For sub-national Green Banks, the Climate Bank will also be a source of capital. The relevant parameters to consider for Climate Bank funding mechanisms to sub-national Green Banks are form, term and cost. The primary forms that could be considered are a grant, a loan and a guarantee.

Based on market considerations and the profile of the underlying types of projects the sub-national Green Banks are likely to finance, the Climate Bank's approach may take the form of a very

long-term and low-cost or no-cost loan. Alternatively, if the objective is to purely maximize the investment and GHG impact that the sub-national Green Banks can achieve, then the funds could effectively be granted to the sub-national Green Bank with the requirement to repay any remaining principal at the end of 30 years.

In determining how to allocate available funds between state and local institutions, the Climate Bank should consider the target market's size, energy price, and carbon intensity. To maximize greenhouse gas reductions, the Climate Bank may tilt towards allocating more capital to sub-national Green Banks that serve large, carbon-intensive markets where the price of existing energy is low.

Purchasing Emissions Reductions Through the Cash for Carbon Program

The Climate Bank is authorized to use its funds to accelerate the retirement of fossil-fuel based power plants, and to purchase fossil fuel resources while still in the ground. Coal plant retirements have been accelerating, but they remain too slow to avoid dangerous climate change at the current rate. Only 10% of existing coal-fired capacity is scheduled to retire in the next 5 years.[33] Accelerating this trend is vital, not only to reduce the amount of emissions from the power sector, but to also create a space for markets to demand a clean power substitute.

Today, when a coal power plant retires in a regulated-utility state, the stranded asset value of that coal plant is passed on to ratepayers, even though the plant isn't operating. Equally problematic is the fact that, if the plant is shut down by regulatory mandate rather than by market forces, the power used to replace the fossil generation may end up costing more. To make this transition fast and politically viable, the cost on ratepayers for the stranded asset needs to fall or disappear, the substitute power must be cheaper than coal power, and regulators must be given a politically viable pathway out of this predicament.

Climate Bank participation will enable this transition to occur more quickly and at lower cost, through a number of interventions. This includes reverse auctions to pay coal plants to stop generating; participating in securitizations to lower the cost passed on to ratepayers to recover the value of stranded assets; and direct negotiations with utilities and regulators to find bespoke financial and regulatory solutions that suit each market situation. The Climate Bank is also authorized to invest directly into communities impacted by plant closures.

[33] "Grid Transformation and Stranded Assets." Lillian Federico and Steve Piper, S&P Global Market Intelligence. July 23, 2019.

Investing in Communities for a Just Transition

As with state and local Green Banks, the Climate Bank provides an equity benefit in that it is designed to deliver clean energy at prices competitive with the existing grid. Low-income households devote a greater proportion of their income to energy. By protecting consumers from energy cost increases, the Climate Bank avoids the regressive nature of these costs.

However, the Climate Bank is also empowered to take a more active role to address inequities related to the burning of fossil fuels and the transition to clean energy. Low-income communities and communities of color have historically borne many of the worst impacts arising from the use of fossil fuels, while being excluded from many of the economic benefits of the transition to clean energy.

Members of these communities are more likely to be directly affected by pollution emitted by a fossil-fueled power plant, and to suffer from related health effects like asthma and preterm birth.[34] They are disproportionately affected by extreme weather events that are worsened by climate change, including heat waves and degraded air quality.[35]

At the same time, these communities face barriers to the adoption of clean energy technologies. Low-income households are more likely to be renters, who are prevented from modifying their homes by adding rooftop solar or efficiency improvements. In cases where low-income families own their homes and wish to make these improvements, a poor credit rating may be a barrier to financing the work, even in cases where the long-term savings would be significant.

As part of the Cash for Carbon program, the Climate Bank is authorized to directly invest in the communities where fossil-fueled power plants and facilities are closed. More broadly, the Climate Bank is also empowered to prioritize projects that benefit rural communities, low- and moderate-income communities, and communities of color.

Exactly what this would look like at a national scale remains to be determined, and should involve feedback and input directly from affected communities. It could mean targeting clean energy investments towards areas that are suffering the greatest public health impacts from air pollution, causing polluting facilities to run less or even to retire. It could also include efforts like job training so that members of local communities can see direct employment gains from new clean energy projects in the area.

State and local Green Banks are also already developing innovative ways to help under-served communities benefit from clean energy and energy efficiency, and the Climate Bank would be able to provide additional capital to their efforts. Examples include the Connecticut Green Bank's Solar for All program, which was begun after the Green Bank found a racial and income disparity in solar adoption rates in the state. And when it comes to serving renters, Hawaii's new Green Energy Money $aver on-bill financing program is a game-changer.[36]

34 "Multiple threats to child health from fossil fuel combustion: Impacts of air pollution and climate change." Environmental Health Perspectives. Feb. 2017.

35 "Air pollution: Current and future challenges." EPA. Accessed Sept. 2019.

36 "Hawaii's On-Bill Financing Program Unlocks Energy Upgrades for the Masses." GreentechMedia, June 10, 2019.

Conclusion

Scenarios for deep decarbonization of the U.S. economy require reductions from all sectors, and the Climate Bank is accordingly empowered to invest in a diverse range of sectors and categories. The examples provided here illustrate how the climate bank could facilitate decarbonization of power generation, transportation, commercial and residential buildings, agriculture, and more.

By using financing rather than grants, and mobilizing private investment into clean projects, the Climate Bank will be able to maximize its impact and secure the greatest amount of greenhouse gas reductions per public dollar deployed.

The Climate Bank would also be able to work with state and local Green Banks to target projects at a distributed scale that require local expertise. The Climate Bank would be able to provide technical assistance to start-up new local institutions, and provide capital to both new and existing Green Banks.

With the Cash for Carbon program, the Climate Bank would provide an additional push to accelerate the retirement of fossil-fueled power generation, and keep existing fossil reserves in the ground. This program would secure large-scale greenhouse gas reductions at low costs, while also reducing the cost of energy paid by consumers. Fossil-fuel retirements would be replaced by cheaper renewable generation.

Across all efforts, the Climate Bank would prioritize environmental justice, seeking to make sure that disadvantaged communities, and especially communities harmed by the effects of fossil fuels and climate change, benefit from the investments made through these programs.

Taken as a group, this set of interventions can rapidly facilitate the transition of the economy from carbon-intensive to clean technologies, maximizing the impact of each public dollar and lowering consumer costs.

About CGC

The Coalition for Green Capital (CGC) is a non-profit organization focused on accelerating the growth of clean energy markets through the creation of Green Banks. CGC offers a unique and proven capacity as the leading creator, advocate, and expert on Green Banks since 2009. CGC works directly to support the formation of Green Banks with governmental and civil society partners, and provides on-going consulting and guidance to operating Green Banks. For more information visit coalitionforgreencapital.com/.