





JEFFERSON INNOVATION SUMMIT







### DARDEN

Batten Institute for Entrepreneurship and Innovation

8

Establish Early-Stage Investment Programs for Underserved Regions



Declare a "New Deal" for Clean Technology



Educate the Public on Clean Technology 16

Delegates, Authors, and Contributors

### **Executive Summary**

Climate change poses one of the most significant and singular challenges faced by society. Time is of the essence. Scientists warn that global warming must be kept below 2 degrees Celsius to avoid significant global disruptions. Getting there will require near total decarbonization of economic activity by 2060. What actions can we put into motion today that will get us on track to nearly eliminate  $CO_2$  emissions in the next 40 years?

Our ability to rise to meet this challenge will require more than incremental change. It necessitates substantive and disruptive innovation across a broad spectrum of industries. Electrification of key industry sectors, such as transportation and manufacturing, needs to happen simultaneously with the shift of energy production from fossil fuels to renewables and other zero-emission technologies. Underpinning any activity is a focus on innovating the technologies and industries of the future, that address climate change, while simultaneously creating jobs and driving economic development. How can we increase the rate at which disruptive, clean technologies are created, introduced, and adopted in the United States and worldwide?

To help answer this question, the **2018 Jefferson Innovation Summit** brought together 50 delegates to discuss levers that may be pulled to energize our innovation engine. Over the course of a day, the delegates debated challenges and ideated solutions in both public and private spheres. This policy playbook is the culmination of those discussions. We use the term "policy" broadly to refer to federal, state, and local public policy, as well as actions by non-governmental organizations and private corporations and businesses. **Six policy actions were identified** by working groups at the Summit, and are summarized in this playbook. While each action is written to stand alone, there is a synergy between them and benefits that could be gained from their collective implementation. For example, establishing early-stage investment programs in underserved regions might help to achieve the goal set forth in raising public awareness.

The purpose of the playbook is to present new and innovative ideas for more rapidly moving the needle on addressing climate change. The policy actions presented here are motivated by a need to catalyze clean technology innovation. Recognizing that leadership by the federal government is unlikely in the current politicized environment, the playbook suggests a bottom-up approach to influencing change. Innovating for climate change will require solutions that address both mitigation and adaptation. The action items included in this report, while stated with mitigation in mind, are often applicable to innovating adaption strategies as well.

The playbook is not intended to provide detailed steps for deploying each action. Rather, our hope is that leaders in both the public and private spheres will be inspired by these ideas and will mobilize the investment and human resources needed to implement them. Launch a National "Moonshot" on Clean Technology

Create a National Cleantech Bank

Establish Early-Stage Investment Programs for Underserved Regions

Build the Utility of the Future

Declare a "New Deal" for Clean Technology

Educate the Public on Clean Technology Delegates also identified carbon pricing as an important lever for addressing climate

change. Many economists believe that putting a price on carbon is the best way to drive innovation in clean technology. Indeed, even a modest price signal on carbon pollution would significantly incentivize many of the policies recommended here. Yet even as potential policy drivers such as a growing need for additional revenue at the federal level add up, carbon pricing remains politically polarized. Given our desire to recommend novel approaches that break the current political stalemate, we did not include carbon pricing among our final recommended list of actions.

## ACTIONONE

## Launch a National Moonshot on Clean Technology

In 1969, NASA put a man on the moon. This accomplishment represented years of scientific research and investment, bringing together scientists from around the world to tackle the daunting challenge of human space travel.

Climate change is such a science and technology challenge. Like the moon landing, it can only be solved by setting aggressive goals and putting money and collective brain power into technology development. We need an ambitious and inspirational vision for our clean technology future and a specific goal for achieving it. To meet such a goal, we will need significant R&D investment in clean technologies in order to move them from emerging to dominant technologies that will outcompete incumbent technologies in price and performance.

In today's political climate, that "moonshot" investment will likely have to come from outside the federal government. Private sector leadership is needed to more aggressively push forward clean technology development. Pilot projects are a vehicle to test new ideas and help establish a clear path forward for widespread deployment. Cities are well-positioned to serve as proving grounds for new, innovative programs and technologies. Pilot locations should be strategically chosen based on region, diversity, density, political environment, and climate challenges. Results of these pilots can help to inform a national strategy.

DARDEN Batten Institute for Entrepreneurship and Innovation

INIVERSITY

One such pilot might be Puerto Rico. After Category 5 Hurricane Maria, public utility workers found that 80% of the electric grid was impacted<sup>1</sup>. The island has an opportunity to build a smarter, more resilient and reliable electric grid, serving as a test bed for infrastructure updates and the grid edge technologies needed to support a modernized electric system.

Leadership will need to come from a consortium of private companies, state and city governments, universities, and non-profits. A national organization could be created to serve as a catalyst by setting goals and providing a clearing house for information, sharing lessons learned, and convening key stakeholders to discuss new ideas. The organization could coordinate lobbying efforts around federal R&D funding for clean technology. A new narrative needs to be developed to communicate that investing in clean technology R&D will secure our position as a global leader in technology innovation and help create jobs and economic growth in the United States and beyond.

<sup>1</sup>Maria Gallucci, "Rebuilding Puerto Rico's Power Grid: The Inside Story", IEEE Spectrum, March 12, 2018, https://spectrum.ieee.org/energy/policy/rebuilding-puerto-ricos-power-grid-the-inside-story.

<sup>2</sup>C40 Blog, American Mayors Pledge Climate Leadership in Response to United States Presidential Election, December 2, 2016, http://www.c40.org/blog\_posts/american-mayors-pledge-climate-leadershipin-response-to-united-states-presidential-election.

#### **The C40 Cities Climate**

**Leadership Group** is a network of 90+ cities with a mission to "tackle climate change and drive urban action that reduces greenhouse gas emissions and climate risks, while increasing the health, wellbeing and economic opportunities of urban citizens." C40 cities benefit from information exchange, technical assistance, and networking as they implement their own climate actions; collectively, they are making a difference around the globe.

"

Mayors don't look at climate change as an ideological issue. They look at it as an economic and public health issue. Regardless of the decisions of the [U.S.] administration, U.S. mayors will continue to deliver action and lead the way.<sup>2</sup>"

MICHAEL BLOOMBERG President of the C40 Board C40 Mayors Summit 2016

05

Business Innovation and Climate Change Initiative

## Create a National Cleantech Bank

Clean energy technologies and projects are often viewed as high-risk investments that require significant and patient capital. Large private financial institutions are beginning to offer cleantech financing but they are focused on large-scale, low-risk projects. Funding solutions are not scaling fast enough. To speed deployment of clean technologies, lending options need to be more widely available.

A federally-owned national cleantech bank seems unlikely in the United States. The Green Bank Act of 2017 introduced in the U.S. House and Senate proposes to create a quasi-public national bank that would fund loans, loan guarantees, debt securitization, insurance, and other forms of risk management to state, municipal, and regional green banks<sup>3</sup>. This is the third time in eight years that this idea has been pitched with little interest. Sponsors of the bill point to the belief that "the private market can fill this [financing] gap adequately"<sup>4</sup> as a barrier to garnering bi-partisan support.

Yet while many large private financial institutions are interested in serving this role, the size and distributed nature of clean technologies and projects often prohibit them from doing so. Regional green banks in New York, Connecticut, California, Hawaii, Rhode Island, and Maryland have been established explicitly to fill this gap. These publically-funded banks aim to accelerate private investments in clean technologies within their respective regions. By 2016, a cumulative



\$1.6 billion had been invested in clean technologies and projects through these regional banks<sup>5</sup>. Yet more is needed.

Securing investment from the private sector will be critical to more quickly expand and scale green financing nationally. What will make these smaller investments more attractive to these organizations? Without federal leadership, how might we create a national network? To answer these questions, interviews could be conducted with regional green banks and large financial institutions to identify the gaps, needs, and opportunities. A non-profit, like the Coalition for Green Capital, could compile this information and convene industry discussions, working toward scalable lending solutions. Over time, a national lending model might be developed that could be used to establish other regional banks and attract private-sector partnerships. Success at the regional level could demonstrate the value of clean technology investing on a national scale.

#### Last year, NY Green Bank

**announced** an effort to solicit third-party capital to accelerate clean technology deployment within the state and more broadly throughout the country. The proposal was developed on the premise that such an expansion will help to more quickly accelerate financing for sustainable infrastructure projects nationally, which will result in greater standardization and liquidity in the market, reducing costs for all.

### "

This expansion of the New York Green Bank will combat climate change while creating good-paying clean energy jobs across the state, helping to secure a cleaner and greener tomorrow for all New Yorkers."

ANDREW M. CUOMO New York Governor October 2017 press release

<sup>&</sup>lt;sup>3</sup>Fact Sheet: The Green Bank Act of 2017 (H.R. 2995/S. 1406), Office of Representative Elizabeth Esty, https://esty.house.gov/ sites/esty.house.gov/files/wysiwyg\_uploaded/FACT%20SHEET%20U.S.%20Green%20Bank%20Act.pdf.

<sup>&</sup>lt;sup>4</sup>Chijioke Onyekwelu, "Will a National Green Bank Act Win Support?", Yale Center for Business and Environment, Clean Energy Finance Forum, July 18, 2017, https://www.cleanenergyfinanceforum.com/2017/07/18/will-national-green-bank-act-winsupport.

<sup>&</sup>lt;sup>5</sup>Keith Larsen, "Filling the gap: Why demand for green banks is growing", Green Biz, May 15, 2017, https://www.greenbiz.com/ article/demand-green-banks.

## Establish Early-Stage Investment Programs for Underserved Regions

To achieve the scale of innovation needed to meet climate goals, we must provide the vehicles by which ideas can grow and flourish everywhere. For many communities, the challenge is not a shortage of ideas, but rather a lack of access to the knowledge, mentoring, and capital needed to go from great idea to start-up to scaled venture. Innovation in Silicon Valley won't get us there alone. Innovators and entrepreneurs need to be supported in regions of the United States that don't otherwise have access to start-up funding and resources.

Nearly 3,000 start-ups were funded by over 150 U.S.-based accelerator programs in 2016<sup>6</sup>. Yet, the majority of these programs reside in a small number of cities. In fact, data suggests that 75% of venture capital investments go to the top 5% of cities nationwide, with very high concentrations in San Francisco-Silicon Valley, Boston-Cambridge, and New York<sup>7</sup>. How do we expand local entrepreneurship networks and more effectively scale clean technology innovation across the country?

The first step is to identify underserved regions where incubator or accelerator programs either don't yet exist or don't meet current needs. Local programs can be created to recruit cohorts that offer solutions for mitigating climate change, but don't have access to capital. For the first three months, local entrepreneurs would receive business 101 training, get help developing a business plan, and gain access to mentors and industry experts. The next three months would be focused on helping to create the pitch and providing access to financing vehicles and venture capitalists.





This approach is similar to that of many incubator and accelerator programs operating today. The differences are the clean technology focus and a requirement that the cohort commits to bring business back to the local community that supported their start-up ideas. In the end, the entrepreneur invests in the community's economic growth and feeds the entrepreneurial engine. Universities, non-profits, and state and local organizations could help fund the programs.

A national association of local clean technology incubators and accelerators could be established to help coordinate efforts, share best practices, and help lobby for federal support. For example, last year the Startup Opportunity Accelerator Act (SOAR) was introduced to Congress, which would provide funding for organizations that establish accelerators within targeted underserved regions and for individuals, including women, veterans, minority-entrepreneurs, those with disabilities, and rural communities<sup>8</sup>. If passed, SOAR could be leveraged to create clean technology accelerators in targeted regions.

<sup>6</sup> Gust U.S. and Canada Accelerator Report 2016, http://gust.com/accelerator\_reports/2016/us\_and\_canada/.

'lan Hathaway, "Accelerating growth: Startup accelerator programs in the United States", Brookings Institute, February 17, 2016, https://www.brookings.edu/research/accelerating-growth-startup-accelerator-programs-in-the-united-states/ and "Start-Up Capital Is Spreading Across the U.S", Harvard Business Review, February 23, 2015, https://hbr.org/2015/02/start-up-capitalis-spreading-across-the-u-s.

\*Congress.Gov, Legislation: 115th Congress, H.R.4071 - SOAR Act, https://www.congress.gov/bill/115th-congress/house-bill/40 71?q=%7B%22search%22%3A%5B%22hr+4071%22%5D%7D&r=1.

### Venture capital firm Revolution's

Rise of the Rest<sup>®</sup> tour brings investors to the entrepreneur. The tour travels to five cities over five days, holding a pitch competition in each city and funding at least \$500,000 annually in local startups. Cities have included Atlanta, Baltimore, Des Moines, Louisville, and Cincinnati. Investors in the seed fund include founder Steve Case, Jeff Bezos, Michael Blomberg, and Howard Shultz. Since 2014, Steve Case and the Revolution team have traveled more than 8,000 miles to 33 cities. Last year, Case and JD Vance announced a \$150 million ROTR Fund, backed by entreprensurs and investors that share the belief that "the next great startup investments are located outside of coastal cities".

## Build the Utility of the Future

POLICY PLAYBOOK

Historically, electricity has been distributed largely through a centralized utility model. With the rise of renewables like wind and solar, thousands of distributed energy generators are coming onto the grid. For these cleantech solutions to reach their full potential, we need to reliably manage them by building a smarter, more flexible electric grid. This requires significant innovation, both in terms of technology improvements and changes to the utility business model.

With grid modernization comes utility concerns around distributed energy resource management and cybersecurity<sup>9</sup>. At the same time, customers are demanding more transparency and accountability from their energy providers and clean energy options<sup>10</sup>. Utilities recognize the need to shift their business models to better serve these customers but are challenged by an uncertain regulatory future.

At the state level, regulatory incentives need to focus on consumer choice and education, integration of distributed energy resources behind the meter, enhanced planning, peak demand reduction, increased reliability and access, and support of cleantech innovation (like electric vehicles). Utilities need to be provided the space to innovate and the freedom to fail. Development of new rate structures and investment in smart grid technologies will ensure that utilities are well-positioned to support, and will benefit from, the growth of renewables.

Although several pilots are underway today, guidelines and best practices don't yet exist that can help guide utilities as they evaluate



<sup>10</sup>lbid.

#### DARDEN Batten Institute for Entrepreneurship and Innovation

changes to their own business models. According to Utility Dive, 44% of utilities would strongly prefer performance-based metrics and incentives in regulatory models<sup>11</sup>, but many don't know where to start. Piloting a performance-based approach in several utility territories would provide lessons learned and give utilities the confidence they need to transition away from existing rate-based structures and roll out new programs. State regulators can also use this information to amend current policies to provide for more rate flexibility.

An industry association or national consortium of utilities, state regulators, and clean technology providers could serve as a clearinghouse for best practices, guidelines, and metrics. Data and information could be shared through published reports, databases, programs, and other publicly-accessible tools. Working towards a common national moonshot goal (see action item #1), utilities and states could compete to deliver innovative solutions to their customers, ultimately attracting progressive corporations and driving economic growth.

<sup>9</sup>Utility Dive and PA Consulting, State of the Electric Utility Survey 2018, https://s3.amazonaws.com/dive\_assets/rlpsys/ SEU\_2018\_Survey\_final\_web.pdf.

### The Smart Electric Power Alliances (SEPA's) 51st State

**Initiative** is bringing together creative minds from the public and private sectors to establish a shared, innovative vision of a modernized grid, free of any regulatory constraints, and to develop blueprints for implementing this vision. Comprised of 500+ industry thought leaders and subject-matter experts, the initiative is focused on developing practical tools and sharing information that can help industry stakeholdersutilities, regulators, technology firms and consumers-work together to find collaborative solutions for energy transformation that will benefit all. The 51st State Initiative provides industry stakeholders and thought leaders the opportunity to leverage cutting-edge, real-world developments, contribute to and learn from innovative new ideas, and deploy insights within jurisdictions ready to embrace change.

## Declare a New Deal for Clean Technology

At the heart of President Franklin D. Roosevelt's New Deal policy was the desire to address economic challenges by putting people back to work. The Hoover Dam, one of many New Deal federally-funded reclamation projects of the 1930s, employed more than 20,000 workers. These projects were good for the economy and, often, good for the environment.

As the country transitions to a clean energy economy, generations of workers are being left behind, impacting local economies built around fossil fuel generation. Coal's share of the energy generation mix has declined by 53% since 2006<sup>12</sup>. More than 30,000 coal mining and support jobs have disappeared in the United States in just the last five years<sup>13</sup>. Meanwhile, 85% of solar companies recently surveyed by the Solar Foundation reported that it has been "very difficult" or "somewhat difficult" to hire employees<sup>14</sup>, citing lack of experience and training.

The challenge lies in matching geography and skilled labor. To this end, we propose incentives for public and private investment in affected communities and the training and reskilling of their workforce. A comprehensive analysis should be conducted to identify the regions that have experienced significant job loss due to declining fossil fuel industries. Each region can then be evaluated for its ability to host clean technology research, manufacturing, construction projects and/or support services. A detailed mapping of clean energy needs and regional readiness can provide some insight into where investments would have the greatest economic impact.



DARDEN

Batten Institute for Entrepreneurship and Innovation

Each region identified will have unique conditions and requirements that will be best addressed at the state level. To encourage local investments, government incentives such as corporate tax credits could be given to clean technology companies that establish operations in severely affected regions and invest in local workforce training. This could be funded by the federal government as part of a "new deal". Training could be provided through state and local education programs or private companies. A non-profit organization could be created to serve as a national clearinghouse for information exchange among regional programs and to connect workers with clean technology jobs and training opportunities.

12 U.S. DOE, 2017 Energy and Employment Report, January 2017.

<sup>13</sup>Bureau of Labor Statistics, U.S. Coal Mining Jobs, 2012-2017, Data, Tables and Calculators by Subject, https://data.bls.gov/ timeseries/CES1021210001

<sup>14</sup>The Solar Foundation, National Solar Jobs Census 2017, www.SolarJobsCensus.org.

<sup>15</sup>Appalachian Regional Commission, "Investing in Coal-Impacted Appalachia", Fact Sheet, March 2017, https://www.arc.gov/ images/appregion/fact\_sheets/Investing\_in\_Coal-Impacted\_Appalachia\_Fact\_Sheet.pdf

<sup>16</sup>Coalfield Development Corporation website, http://coalfield-development.org/.

### **In Appalachia, 33,500 coal mining jobs disappeared** between 2011 and 2016, accounting for 82%

of total job loss<sup>15</sup> in the region. One non-profit organization is working to train coal workers while simultaneously growing a new Appalachian economy. Coalfield Development Corporation provides workforce training and jobs for displaced coal workers in green building, solar installation, and farm and food entrepreneurship and it educates local youth on career paths that support sustainable economic growth. The organization is supported by dozens of companies and organizations from the public and private sectors<sup>16</sup>.

## 374K \*\*\*\*

In 2017, solar employed almost 374,000 workers, or 43 percent of the electric generation workforce.

U.S. DOE 2017 Energy and Employment Report

## Educate the Public on the Need for Clean Technology

a prosperous and sustainable future for generations to come. That's a powerful message, but it is not a mission that everyone is onboard with or knows how to support. For the skeptical audience, how do we convince them of the importance of innovating to address climate change? For those ready to take action, how do we educate and empower them to make a difference? It all starts with a more effective, localized framing of the issues and a clear call to action.

Clean technology innovation is about global leadership and ensuring

Many people in the United States are not well versed in the science behind climate change. Even in regions affected by extreme weather events, the relationship between climate change and disaster isn't always clearly understood and motivating action can be daunting. Current messaging overly intellectualizes the issues and often excludes the general public. National public education campaigns are more effective if they use messaging that is relatable to everyday life.

First, the nomenclature needs to shift from "climate change" to something more broadly recognizable. Many people see climate change as a distant issue, both in terms of timeline and location. Even in populations well-versed in climate change issues, clear action items remain elusive. How do we determine the right messaging to compel all Americans to take action and provide them with the education and means to support clean technologies?

A series of pilot public education campaigns could be developed in strategically-selected regions to better understand what messages





resonate with consumers in different types of communities. Diversity in consumer profile is key. Messages that positively impact behavior change in urban areas likely won't speak to rural communities. Pilot results will inform the development of a national campaign that speaks to the collective interest and concern of all Americans, regardless of their stance on climate change. A national theme might be something like "join us in creating the industry of the future".

A national consortium, funded by private companies and non-profits, could be created to oversee the regional pilots, convening members to discuss the findings and develop the national public education campaign. States and regionally-focused outreach organizations could use the national campaign, and associated logo, to build their own targeted campaigns.

<sup>17</sup> Jennifer Marlon, Peter Howe, Matto Mildenberger, and Anthony Leiserowitz, "Yale Climate Opinion Maps – U.S. 2016", Yale Program on Climate Change Communication, http://climatecommunication.yale.edu/visualizations-data/ycom-us-2016/?est=h appening&type=value&geo=county.

### According to Yale's Climate

**Opinion Map,** while 56% of Americans believe that climate change will harm U.S. residents only 38% believe they will be personally harmed. In Texas and Florida, where natural disasters have wreaked havoc on coastal communities, this belief is only slightly higher than the national average<sup>17</sup>.



of Americans support funding research into renewable energy sources

Yale Climate Opinion Maps - U.S. 2016

### **Summit Delegates**

Bill Antholis University of Virginia Miller Center

George Ashton Sol Systems

George Barbee University of Virginia Darden School of Business

Drew Bond The American Council for Capital Formation (ACCF) Center for Policy Research

Jan Canterbury *AscentVirginia*, *Inc.* 

Adam Chambers Pinhead Climate Institute

Ann Condon (Retired) General Electric Company

Scott Davis FLIK Hospitality

Peter Debaere University of Virginia Darden School of Business

Linda Dudenhoeffer Monsanto

Sam duPont Baltimore Gas and Electric Company

John Englander International Sea Level Institute

Greg Fairchild University of Virginia Darden School of Business

Kevin Fitzgerald Energy Impact Partners

Mark Goodwin Apex Clean Energy

Chandra Govindarajalu The World Bank

Andrew Green Capital One

Gina Green Tetra Tech

#### Yuri Horwitz Sol Systems

Arjun Krishnaswami NRDC

Josh Lachs Net Impact

Erica Lock Echoing Green

Michael Lucy Sustainable Life Designs

Tom Madrecki UPS

Ben Margolis Genseed Advisors

Allie Medack General Motors

Robin Millican *bgC3* 

Tom Murray Environmental Defense Fund + Business

Erika Myers Smart Electric Power Alliance

Katherine Neebe *Walmart* 

Elizabeth Noll NRDC

Chrissa Pagitsas Fannie Mae

Stephen Pantano CLASP

Vivek Patil AscentVirginia, Inc.

Bill Prindle ICF International

Stefan Reichelstein Stanford Graduate School of Business

Aaron Revere Resource Environmental Solutions

Rocky Rief The Coca-Cola Company

Anna Siefken Wilton E. Scott Institute for Energy Innovation, Carnegie Mellon University Val Smith *Citi* 

Elizabeth Tate Johnson Controls

Lauren Taylor Mentor Capital Network Sustainable Business Plan Competition

Andrea Trimble University of Virginia Office for Sustainability

Daniel Vermeer Duke University Fuqua School of Business

Jesse Vogel Partnership for Responsible Growth

Devin Welch Sun Tribe Solar

Tommy Wells District of Columbia Department of Energy and Environment (DOEE)

Malcolm Woolf Advanced Energy Economy

### **Lead Authors**

Rebecca Duff Batten Institute for Entrepreneurship and Innovation, Researcher

Michael Lenox Business Innovation and Climate Change Initiative, UVA Darden Faculty Lead

### Contributors

Sean Carr Batten Institute for Entrepreneurship and Innovation, Executive Director

Erika Herz Batten Institute for Entrepreneurship and Innovation, Director of Research and Intellectual Capital

Derry Wade Batten Institution for Entrepreneurship and Innovation, Associate Director of Strategic Initiatives and Outreach

Geoff Molinaro Group M Design, Graphic Designer

### BUILD THE UTILITY OF THE FUTURE

create standardized performance metrics



Choosing the Six Policy Actions:

Delegates were asked to vote on the actions above that came out of a small group ideation exercise.

### The Business Innovation and Climate Change initiative aims to

further discussions around the role of business in driving clean technology innovation through leadership education, multi-stakeholder events, applied research and bipartisan analysis.

www.darden.virginia.edu/innovation-climate

**The Batten Institute for Entrepreneurship and Innovation** seeks to improve society by creating knowledge about the transformative power of entrepreneurship and innovation and by cultivating principled, entrepreneurial leaders.

www.darden.virginia.edu/batten-institute/



DARDEN

Batten Institute for

Batten Institute Darden School of Business University of Virginia P.O. Box 6550 Charlottesville, VA 22906-6550

©2018 The Darden School Foundation All rights reserved.