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Kleinman Center for Energy Policy

2018–2019 Annual Report

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HIGHLIGHTS



THIS YEAR'S GIFT



LETTER FROM THE DIRECTOR & DEAN

Here at the Kleinman Center, we like to say that we own Benjamin Franklin like nobody else on campus.

Most know him as the founder of the University of Pennsylvania. But we know him as America's first energy scholar. Benjamin Franklin discovered electricity, invented the lightning rod, and organized fire insurance—thereby integrating impact across science, technology, and policy.

This spectacular new gift of \$30 million empowers the Kleinman Center to carry forward Benjamin Franklin's legacy of innovative excellence in energy policy.

In response to this gift, we are setting ambitious targets. We will expand the curriculum available to Penn students, attract top faculty to teach these students, and grow our influence over energy policy at home and overseas with smart, timely, and applied research.

We will still continue offering what we have developed: a graduate certificate in energy management and policy, the best internship opportunities available for Penn students, grants for innovative faculty research, a spectacular annual Carnot Prize event, and our own original research—ensuring that it gets into the hands of key decision-makers.

Financial gifts are essential to our operation and continuation, and for this, we thank our benefactors. Equally essential are those gifts of personal time and effort. Many of you reading this report have collaborated with us to dream, plan, create, and promote the work of the Center. For your generosity, we also thank you, and look forward to continuing our work together for many years to come.



Mark Alan Hughes
*Faculty Director,
Kleinman Center
for Energy Policy*



Frederick Steiner
*Dean and Paley Professor,
Stuart Weitzman
School of Design*

Benjamin Franklin discovered electricity, invented the lightning rod, and organized fire insurance—thereby integrating impact across science, technology, and policy.

FIVE YEARS OF GROWTH: SELECT HIGHLIGHTS



A PRESCIENT REPORT

PHILADELPHIA'S
REFINERY ON FIRE

AUTHOR

Christina Simeone, *Director of Policy and External Affairs, Kleinman Center*



Read the full paper:

kleinmanenergy.upenn.edu/paper/beyond-bankruptcy

On June 21, 2019, Philadelphia residents awoke to a large explosion that resulted in fire at Philadelphia Energy Solutions (PES), the largest refinery in the eastern United States. In the aftermath, a Kleinman Center report suddenly took center stage, and was referenced in more than 75 media outlets.

The report, written nine months earlier by Director of Policy and External Affairs Christina Simeone, warned of the refinery's substandard equipment, continuing financial woes, widespread pollution, and failure to follow public comment rules.

Amidst mounting pressure, PES announced it would shut down the refinery.

ABOUT THE REFINERY

The sprawling 1,300-acre footprint of land located just a few miles southwest of Center City, Philadelphia has been home to petroleum storage and refining activities since 1866. PES is the current owner of the facility, the oldest and largest refinery on the East Coast.

LEGACY OF FINANCIAL WOES

After PES successfully navigated bankruptcy reorganization in August 2018, the report points out that—regardless of the unanticipated fire and current closure—the refinery would likely have faced a second bankruptcy on or before 2022 when its debts would mature.

LEGACY OF POLLUTION

The history of pollution contamination at the refinery site is profound, given it has been home to hydrocarbon processing for over 150 years. The soil and groundwater at the site are heavily contaminated with hydrocarbons and a list of other toxic compounds. In some areas, contaminants have migrated offsite, and a drinking water aquifer used by the state of New Jersey could potentially be impacted.

Sunoco (owned by Energy Transfer Partners) is a part owner of PES and maintains legal liability for historic contamination at the site. Sunoco entered the facility into Pennsylvania's voluntary Land Recycling Program (Act 2 of 1995) and struggled to characterize pollution at the site, stabilize migrating pollution plumes, develop site-specific risk-based pollution concentration standards to achieve (i.e. standards less stringent than statewide health standards), and complete other required tasks.



LACK OF PUBLIC INVOLVEMENT

Meanwhile, the City of Philadelphia, local communities, and other interested stakeholders were not allowed adequate opportunity to be informed or involved in remediation planning for the refinery. This is inconsistent with the legal requirements of Pennsylvania's Act 2.

The omission of public involvement in the remediation planning for the refinery is a meaningful grievance. Given the magnitude, severity, and toxicity of the site's contamination, coupled with its proximity to highly populated environmental justice neighborhoods, population centers, and drinking water resources, public involvement is critical to informing the municipality and community about existing risks, appropriateness of site-specific standards, and remediation options.

At the time of this annual report's publication, public comment sessions are in full force—but organized by the city of Philadelphia; not Sunoco. The Kleinman Center is actively participating in these public comment sessions, gathering related Penn researchers to advise on the best use of Philadelphia's contaminated refinery site.

THE WALL STREET JOURNAL

“This does raise some really interesting questions that people should ask. Do we really understand the dangers of industrial petrochemical manufacturing in a highly populated area?”

—CHRISTINA SIMEONE
FEATURED IN *THE WALL STREET JOURNAL*

Above: The PES refinery on fire. Located just south of Philadelphia's city center, the refinery was producing 335,000 barrels of crude oil a day and was Philadelphia's single biggest air polluter. It is now closed. Photo courtesy of NBC News Philadelphia.



FEATURED EVENT

CARNOT PRIZE AT PENN

THIS YEAR'S FOURTH ANNUAL CARNOT PRIZE FOR DISTINGUISHED CONTRIBUTIONS TO ENERGY POLICY WAS AWARDED TO PIYUSH GOYAL, INDIA'S MINISTER OF COAL AND RAILWAYS AND FORMER MINISTER OF POWER AND RENEWABLES.

WHY A COAL MINISTER?

During his tenure, Piyush Goyal directed a fast-track effort to electrify 18,000 villages in remote parts of India. He was also instrumental in reforming India's power markets and expanding renewable energy.

While India has relied heavily on coal to end energy poverty—like China in recent years and the United States decades ago—India's coal expansion appears to have peaked and the permanent transition to cleaner energy is underway.



Piyush Goyal
2018 Carnot Prize Recipient

“It is both a personal honor, as well as a tribute to the efforts of all involved in this great work throughout India, to be recognized with the Carnot Prize by the University of Pennsylvania.”

—PIYUSH GOYAL



Piyush Goyal came to Penn campus last October, for our Carnot Prize award ceremony and lecture. Soon after he arrived, an emergency in India pulled him home immediately. Penn students, faculty, deans, and friends gathered that day to pay tribute to the minister, in his absence.



Aaswath Raman, assistant professor of electrical and systems engineering, gave a lecture in honor of the minister. His talk title: “Harnessing the Cold of Space as a Renewable Resource.”

That day, our faculty director promised to bring the award to Goyal in New Delhi.



In January, a team from the Kleinman Center for Energy Policy gathered in New Delhi for an award ceremony with Goyal's friends and family and government officials.



After the ceremony, Goyal met with the press, who covered the event.

CARNOT PRIZE IN INDIA



Fatih Birol of the International Energy Agency, and 2016 Carnot Prize recipient presented the award.

"It is both a personal honor as well as a tribute to all of the efforts of those involved in this great work in India," said Goyal, "to be recognized with the Carnot Prize."



"The international achievements of Minister Goyal are remarkable. [He] rolled out India's comprehensive power sector reform, oversaw the world's biggest and most successful LED lighting program, and deployed renewable energy sources. He also helped millions of Indians gain access to electricity."

—FATIH BIROL, 2016 CARNOT PRIZE WINNER,
EXECUTIVE DIRECTOR OF THE INTERNATIONAL ENERGY AGENCY

CENTER RESEARCH

ENVISIONING A CLIMATE ACTION PLAN

The Kleinman Center offers its vision on how best to address the climate crisis.

PROJECT TEAM

Mark Alan Hughes, *Faculty Director, Kleinman Center*

Oscar Serpell, *Research Associate, Kleinman Center*

The Green New Deal is a bold deviation from previously enacted or proposed climate action. Earlier attempts at climate legislation seemed to operate under the motto “do whatever it takes to reduce emissions, as long as it doesn’t change anything.” The Green New Deal asserts that sufficient climate action requires a fundamental change to our existing economic system. The House resolution has reanimated a long-dormant national conversation on climate change policy and this alone is a valuable contribution. Coming on the heels of—and inspired by—the Green New Deal, policy experts, politicians, and thinktanks around the country have recently contributed their ideas and insights to the climate conversation, and the Kleinman Center wants to ensure that we too are offering our vision for a successful national response.

Researchers at the Kleinman Center think that the best way to effectively face the climate crisis is with a focused climate action plan rather than an all-encompassing social, economic, and environmental overhaul of the U.S. economy. Furthermore, a climate action plan should offer effective policy actions with the objective of eliminating carbon emissions as quickly as possible. Researchers at the Kleinman



Photo by Senate Democrats, via Flickr.

Center have developed a climate action plan consisting of the following six policy action areas:

1. Restructuring Federal and State Taxes and Subsidies
2. Supporting Renewable Energy and Energy Efficiency Investment
3. Transforming Land Use
4. Protecting Communities
5. Strategically Defending Assets
6. Strengthening Governance

Over the coming year, our team will continue to further develop this plan and also begin to research many of the remaining questions that must be answered before this plan could be successfully implemented. Some of these questions are:

1. What is the most successful strategy for internalizing the social cost of carbon on a national level?
2. What are the technical and economic limitations to changing land use in the U.S.?
3. What assets can be protected from natural disaster and the energy transition and which should be abandoned or repurposed?
4. What governance changes need to occur before this plan can be successfully implemented and enforced?

FUTURE OF PHILADELPHIA GAS WORKS

Finding a home for Philadelphia’s 183-year old gas utility in a carbon constrained future.

PROJECT TEAM

Amy Chu, *Temporary Lecturer and Researcher at Cal State University, San Francisco*

Benjamin Paren, *Doctoral Student, Materials Science and Engineering*

Girish Sankar, *MBA Student, Lauder Institute*

Oscar Serpell, *Research Associate, Kleinman Center*

Philadelphia Gas Works, or PGW, is the largest municipally-owned utility in the United States. It manages more than 6,000 miles of pipelines and serves half a million customers with natural gas for heating and cooking. Annually, PGW delivers approximately 75 billion cubic feet of natural gas, emitting approximately 4.6 million tons of CO₂ each year. Natural gas accounts for 17% of Philadelphia’s carbon emissions (2012 data).

Decarbonizing the PGW network is a challenge that the city of Philadelphia ignores at great financial and political risk. In its current state, PGW is an obstacle to the city achieving its ambitious emissions goal: an 80% reduction in CO₂ emissions from 2006 levels by mid-century.

Furthermore, the utility represents a potential liability for Philadelphia and the region if and when a state or federal carbon price is imposed. PGW already holds over \$1 billion in long-term debt and our research indicates that even a modest carbon price in the form of a tax or cap-and-trade system would burden PGW’s financial situation.

There are, as we see it, two distinct strategies for achieving the system-wide decarbonization of PGW:

1. **Electrify everything.** Replace all end-user applications like gas fired furnaces and stoves, water heaters, and industrial thermal processes with high-efficiency electric alternatives.
2. **Use cleaner gas.** Replace existing gas with a net-zero-emissions alternative fuel, such as synthetic methane.

Electrifying as many end-uses as possible is perhaps the quickest way to decarbonize. Once heating demand is added to the grid, electricity generators can substitute clean energy in place of fossil fuels. However, a grid powered by renewables relies on storage for the seasonal variation in electricity demand, and currently, there is no efficient or affordable storage solution for this seasonal demand.

Producing synthetic methane involves first splitting water using electrolysis (resulting in hydrogen and oxygen) and then combining the hydrogen with CO₂ pulled from the atmosphere. The electrolysis process is extremely energy intensive and the capture of atmospheric CO₂ requires huge amounts of land.

This leaves us with two costly options. While synthetic methane is expensive to produce, electrochemical batteries are poorly suited for long-term seasonal storage and therefore require an overinvestment in capacity. No financially viable storage alternative exists right now—except perhaps the electrolysis of hydrogen. If hydrogen production is needed for both of these options, synthetic methane may be a more competitive option for Philadelphia and other cities around the world.

Our team is exploring both strategies for decarbonizing PGW, with the goal of determining the comparative costs and advantages of each pathway.

The Philadelphia Inquirer

“It is absolutely clear that the current PGW business model is not sustainable in the world,” Mark Alan Hughes, director of the University of Pennsylvania’s Kleinman Center for Energy Policy, told a City Council committee.

—MARK ALAN HUGHES
FEATURED IN *THE PHILADELPHIA INQUIRER*



Read our research on this topic:

kleinmanenergy.upenn.edu/paper/comparative-pathways-interim-report

kleinmanenergy.upenn.edu/blog/2019/04/26/transforming-pgw-sustainable-model-future



GLOBAL FOSSIL FLOWS

PROJECT TEAM

Bill Cohen, *Center Coordinator, Kleinman Center*

Cornelia Colijn, *Executive Director, Kleinman Center*

Forrest Corcoran, *Master of Science Student in Applied Geosciences, School of Arts and Sciences*

Mark Alan Hughes, *Faculty Director, Kleinman Center*

Oscar Serpell, *Research Associate, Kleinman Center*

Pairing thirty years of United States Energy Information Administration (EIA) petroleum import data with historical monthly rainfall totals, a Kleinman Center team is developing a web-based visualization tool called the “Petroleum Import Visualizer” to better understand the relationship between severe weather and coastal oil operations in the United States.

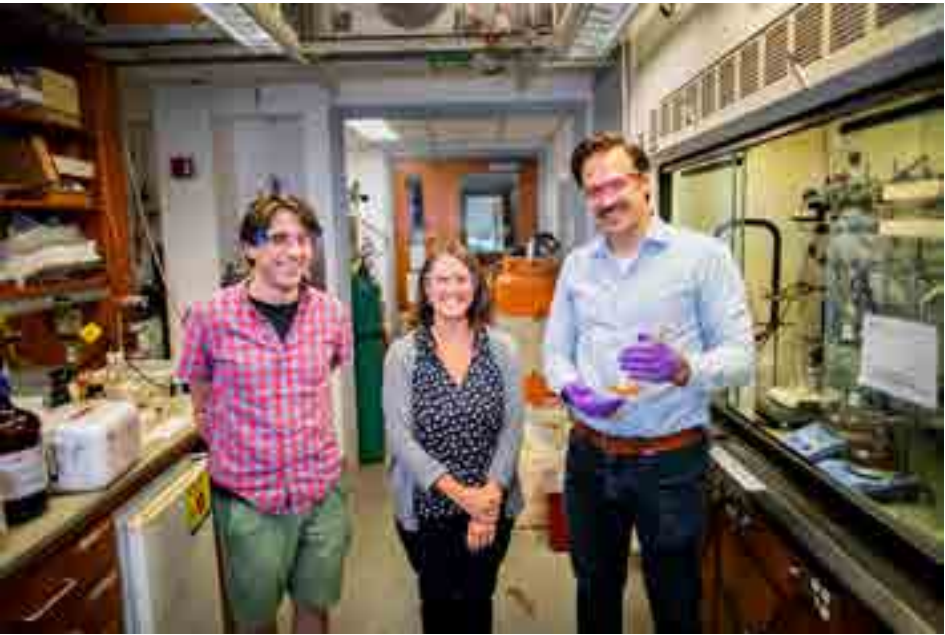
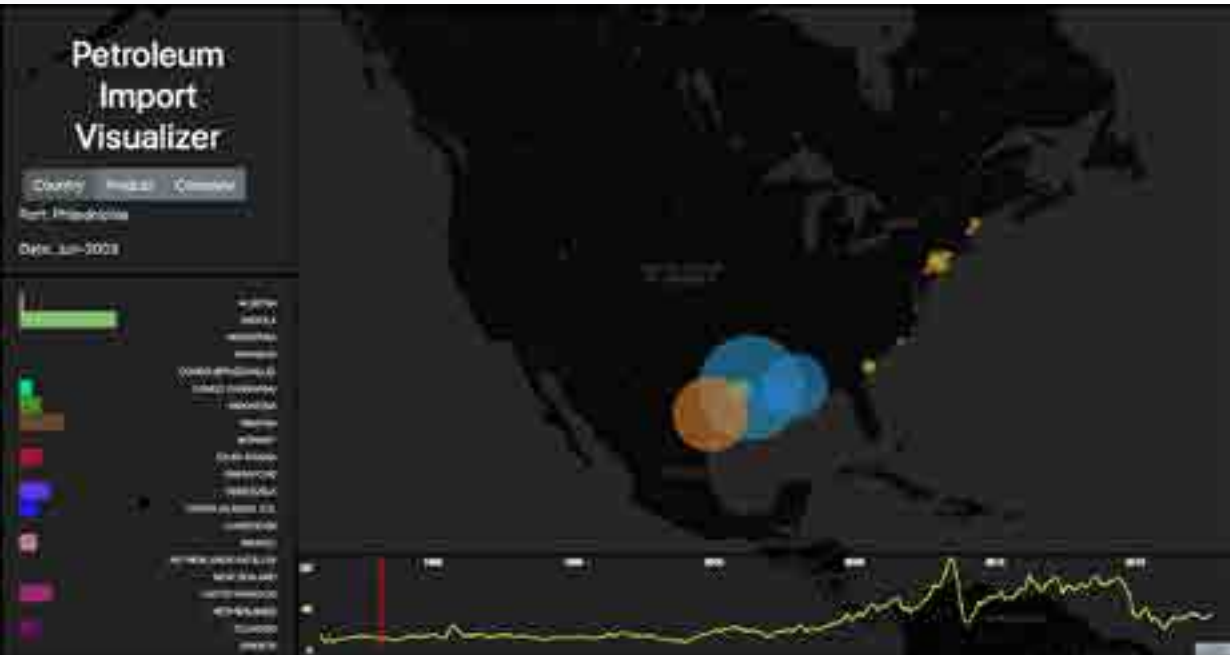
The low-lying Gulf Coast, home to approximately half of U.S. crude and natural gas production and processing capacity, is particularly vulnerable to acute impacts from severe weather such as flooding and storm surge. Such storm events are expected to increase in frequency and intensity, exacerbated by long-term climate-driven changes such as sea level rise, storm surge, and subsidence.

According to the Department of Energy the United States is expected to become a net oil exporter in 2020, creating new resiliency challenges for dynamic supply chains in these vulnerable regions. Current responses such as ship re-routing, inventory stockpiling, and production recapture, may be insufficient in an oil export economy. Insight into historical system- and node-level impacts from acute, short-term disruptions will shed light on the future risk and resiliency of the U.S. fossil fuel trade.

The Petroleum Import Visualizer includes dynamic time series data from 1986–2016 for all major port regions in the U.S., including:

- Monthly total precipitation
- Petroleum import volumes by country, product, and company
- Crude oil price index

Our tool will allow for the selection of a single port, providing the user with additional graphical and time series information. Over the coming year we will continue to improve functionality, build more robust insight analytics, and identify historical storm events and global crude oil disruptions.



NATIONAL SCIENCE FOUNDATION GRANT AWARD

LEAD PRINCIPAL INVESTIGATOR

Eric Schelter, *Professor of Chemistry, School of Arts and Sciences*

This year the Kleinman Center joined efforts with colleagues at Engineering and Arts and Sciences to pursue grant opportunities from the National Science Foundation. Penn was awarded a grant for the creation of a **Center for Sustainable Separations of Metals**.

This new center will conduct research on the fundamental chemistry that can improve the recovery of metals from post-consumer products. This work aims to reduce energy consumption, pollution, and greenhouse gases while providing alternative approaches to unsustainable and unethical metal supply chains.

Kleinman Center's role is to participate in the social science component, with a focus on the analysis of policy implications of any proposed technologies—identifying policy options to facilitate the adoption of resulting innovations.

“The Kleinman Center is a ‘new energy treasure in Philadelphia.’”

—GREATER PHILADELPHIA CHAPTER OF THE ASSOCIATION OF ENERGY ENGINEERS

Above: Through the Center for Sustainable Separations of Metals, (from left) Joseph Subotnik, Jessica Anna, and Eric Schelter will combine their expertise to develop new chemical separation strategies to make recycling more economical.

Below: Using Anna's state-of-the-art laser facility, Penn chemists will collect extremely detailed measurements to see how they can incorporate kinetics into metal separation strategies.

Photos by Eric Sucar.



PUBLICATIONS



FEATURED POLICY DIGEST

POWERING OUR FUTURE WITH TRASH

AUTHOR

Richard Ling, *VIPER Student, School of Engineering and Applied Science and School of Arts and Sciences*



Our vision includes educating the next generation of energy leaders. In practice, this doesn't just take place in the classroom, but includes exposing students to the art and craft of applied research. Richard Ling's waste-to-energy policy digest was made possible with support from our student grants program.



Read the full digest:

kleinmanenergy.upenn.edu/policy-digests/powering-our-future-trash



A worker at the Sierra Energy WTE gasification plant gives digest author Richard Ling (right) a tour of the facility.

Waste-to-energy technology, which uses trash to produce viable energy, has the potential to address two of the most urgent needs of this century—waste management and energy demand.

A GROWING NEED

Every year, our world produces around 2.1 billion tons of waste, which ultimately emits over 7.7 billion tons of greenhouse gases (GHGs) over a 20-year breakdown period. Current tactics to combat GHG emissions from waste include recycling, composting, source reduction, and waste-to-energy (WTE) technology.

To date, roughly 2,200 WTE plants are active worldwide, which constitute roughly 300 million tons of disposal capacity. The U.S., by comparison, currently holds around 86 WTE facilities, which account for just 0.25% of the nation's total generation capacity.

A UNIQUELY U.S. APPROACH

The United States is one of the few major countries that delegates renewable energy targets to the states, which engenders inconsistencies in nationwide adoption. Therein, state governments can create Renewable Portfolio Standards (RPS), which mandate local utilities to achieve a certain proportion of renewable power generation. As of the end of 2018, only 29 states and Washington, D.C. have adopted RPS, and the amount of capital allocated to each renewable practice (e.g. solar, wind, biomass, hydro, WTE) is, in large part, determined by the “Tiers” of the RPS.

In order to make substantive progress towards renewable energy as a nation, more states ought to adopt RPS, or the U.S. should consider a federal mandate that sets measurable renewable energy targets for every state. In any case, these standards are

crucial for widespread renewable energy adoption. In their 2018 U.S. Renewable Portfolio Standards Status report, the Lawrence Berkeley National Laboratory concluded that, “Roughly half of all growth in U.S. renewable electricity (RE) generation and capacity since 2000 is associated with state RPS requirements.”

DISADVANTAGED THROUGH POLICY

Tier 1 sources are given more renewable energy credit (REC) rates than Tier 2 sources. Tier 1 renewable sources include solar, wind, biomass, anaerobic digestion, geothermal, tidal power, renewable fuel cells, small hydro, and poultry-litter incineration facilities. Tier 2 sources include waste coal, distributed generation systems, municipal solid waste (MSW), and large-scale hydro.

Under the RPS, municipal solid waste is not considered to be a fully renewable resource, as the non-biogenic components (e.g. glass, plastics, metals, etc.) are technically non-renewable. However, the EPA defines renewable energy as, “fuel sources that restore themselves over a short period of time and do not diminish.”

Not only does MSW replenish periodically, but it also experiences exponential growth: the World Energy Council projects that global waste generation will double to over 6 million tons per day by 2025 and may reach over 11 million tons per day by 2100. Thus, by the EPA's own definition, MSW should be a fully renewable resource.

DESIGNING BETTER POLICY

A dangerous contradiction is thereby observed: the EPA's strict classification of “renewable” MSW (i.e. the biogenic components) leads to greater landfill emissions. This should never occur in the

realm of energy policy, as the main goal of renewable technologies is to foster a sustainable future for humanity.

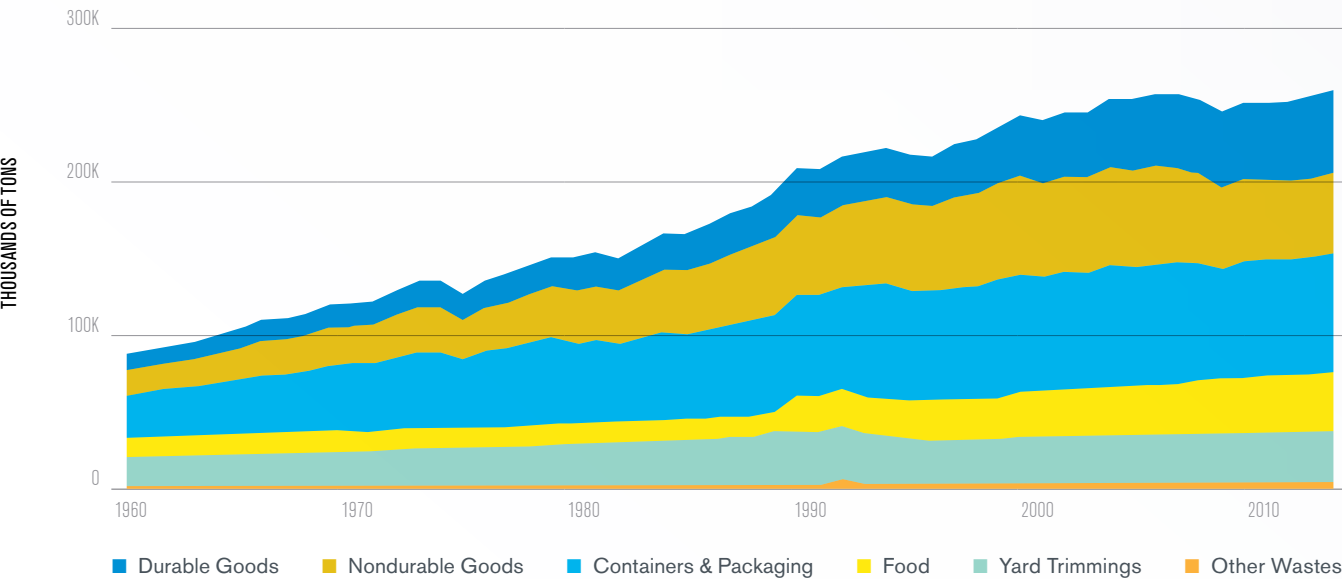
The only way for the U.S. to become a global leader in waste management, besides source reduction, is to pursue a complete overhaul of our current model: we must enable WTE technologies to replace landfills and increase recycling and composting efforts throughout our nation.

To do so, the U.S. must enact favorable policies that designate WTE as a Tier 1 renewable resource, define MSW as a completely renewable feedstock, and provide favorable subsidies to new and existing WTE facilities.

“It's been an absolute pleasure writing for the Kleinman Center. I can't thank you all enough for your support throughout the process.”

—RICHARD LING

COMPONENTS OF MSW BY PRODUCT TYPE IN WEIGHT (U.S.)



POLICY DIGESTS



Read our digests:

[kleinmanenergy.upenn.edu/
policy-digests](http://kleinmanenergy.upenn.edu/policy-digests)



November 7

COMPETITIVE IMPERATIVE:
CHOICES FOR PENNSYLVANIA'S
ENERGY FUTURE

Author:

Christina Simeone, *Director of Policy
and External Affairs, Kleinman Center*

From carbon pricing, to improving
distribution system cybersecurity and
resilience—here are choices to guide
Pennsylvania's energy future.



November 28

WRONG ABOUT URBANIZATION?
HOW EMERGING FACTORS COULD
SHIFT PEOPLE AWAY FROM CITIES

Author:

Oscar Serpell, *Research Associate,
Kleinman Center*

More than half of the world's population
now lives in urban areas, and most analysts
expect cities to double by 2050. Could
changing factors slow this trend? And
how might that impact our energy future?



February 4

PLUGGING THE LEAKS:
WHY EXISTING FINANCIAL
INCENTIVES AREN'T ENOUGH
TO REDUCE METHANE

Authors:

Catherine Hausman, *Visiting Scholar,
Kleinman Center*; Daniel Raimi,
*Senior Research Associate,
Resources for the Future*

While multiple sectors emit methane,
a major contributor is the oil and gas
industry. This digest explores methane's
impacts on climate change and the market
forces shaping leaks and abatement.



February 25

TARGETING NET ZERO EMISSIONS:
A NEW FOCUS FOR A MORE
EFFECTIVE CLIMATE POLICY

Author:

Oliver Geden, *Visiting Scholar,
Kleinman Center*

Temperature targets have advanced the
climate policy debate but failed to catalyze
appropriate action—net zero emissions
targets can deliver on both ends.



March 5

BLACK MARKET CRUDE:
ORGANIZED CRIME AND
ENVIRONMENTAL EXTERNALITIES
IN NIGERIA'S OIL SECTOR

Author:

Jonah Rexer, *Applied Economics
Doctoral Student, Wharton*

In oil-dependent Nigeria, the oil industry
has been plagued with instability,
organized crime, and illegal black markets.
But have efforts to demobilize militant
fighters had an impact on oil and gas
infrastructure attacks and oil-related
criminal violence?



March 21

POWERING OUR FUTURE
WITH TRASH

Author:

Richard Ling, *VIPER Student, School of
Engineering and Applied Science
and School of Arts and Sciences*

Waste-to-energy technology, which utilizes
trash to produce viable energy, has the
potential to address two of the most urgent
needs of this century—waste destruction
and energy demand.



April 1

THE LONG GOODBYE:
WHY SOME NATIONS CAN'T
KICK THE COAL HABIT

Author:

Anna Mikulska, *Senior Fellow,
Kleinman Center*

While renewables are on the rise, coal
usage across the globe remains about
the same. To understand why, developed
countries must take a look at the political
and market challenges facing the
developing world.



April 24

WHY CARBON PRICING
FALLS SHORT AND WHAT
TO DO ABOUT IT

Author:

Jesse Jenkins, *Visiting Scholar,
Kleinman Center*

Paying close attention to distributional
impacts and political economy constraints
is key to understanding why governments
around the world keep falling short on
carbon pricing—and what can be done
about it.



May 16

SELF-IMPOSED EMISSION LIMITS:
IS THERE A CASE FOR
PENNSYLVANIA AND RGGI?

Author:

Jose Miguel Abito,
Assistant Professor, Wharton

Should Pennsylvania join the Regional
Greenhouse Gas Initiative (RGGI)? And
what would happen to energy prices? The
analysis suggests prices could go down,
as long as firms have enough incentives to
invest in new capacity.



June 18

SUPERBLOCKS:
BARCELONA'S PLAN TO
FREE ITSELF FROM CARS

Author:

David Roberts, *Senior Fellow,
Kleinman Center*

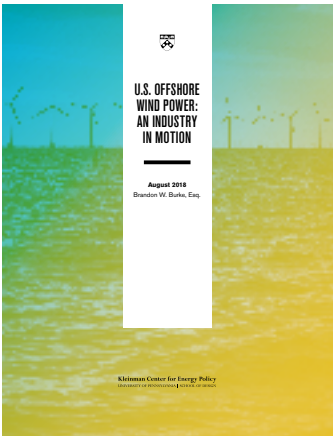
In the quest to improve air quality, reduce
noise pollution, and lessen congestion,
one city embarks on a radical plan. In the
process, its residents find community.



PAPERS



Read our papers:
kleinmanenergy.upenn.edu/papers



August 13

U.S. OFFSHORE WIND POWER:
AN INDUSTRY IN MOTION

Author:
Brandon Burke, *Graduate Research Assistant, Kleinman Center*

Compared to Europe, U.S. offshore wind is in its infancy and faces some of the same obstacles—relative high costs, supply chain constraints, potential impacts to fishing, and visibility concerns. But change is on the horizon.



August 30

COMPARATIVE PATHWAYS INTERIM REPORT

Authors:
Cornelia Colijn, *Executive Director, Kleinman Center*; Mark Alan Hughes, *Faculty Director, Kleinman Center*; Oscar Serpell, *Research Associate, Kleinman Center*

Global climate goals can be heavily influenced by local and regional policies, but only if those policies have local support and benefit local communities. This study explores energy policies that maximize local net benefits and outcomes for the Philadelphia region.

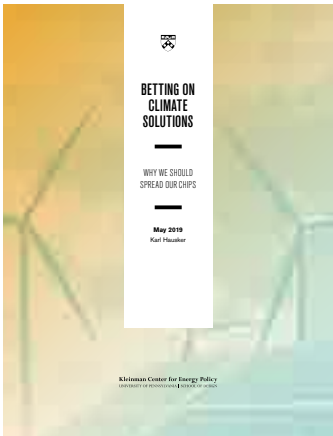


September 20

BEYOND BANKRUPTCY: THE OUTLOOK FOR
PHILADELPHIA'S NEIGHBORHOOD REFINERY

Author:
Christina Simeone, *Director of Policy and External Affairs, Kleinman Center*

Philadelphia Energy Solutions (PES) may face bankruptcy again by 2022. Meanwhile, Sunoco's efforts to remediate legacy pollution at the PES refinery omitted public involvement requirements, raising serious legal questions and new engagement opportunities.



May 2

BETTING ON CLIMATE SOLUTIONS:
WHY WE SHOULD SPREAD OUR CHIPS

Author:
Karl Hausker, *Senior Fellow, Kleinman Center*

How can we decarbonize the electricity sector? Should “clean” mean renewable electricity only (wind, solar, hydro, geothermal, etc.)? Or does “clean” include all zero- and low-carbon sources of electricity?



COMMENTARY



FEATURED PODCAST

A HARD LOOK AT
NEGATIVE EMISSIONS

GUEST

Glen Peters, *Research Director,*
Center for International Climate Research



Much faith is being put in the ability of negative emissions technologies to slow the pace of climate change. Glen Peters of Norway's Center for International Climate Research (CICERO) looks at the potential of negative emissions strategies, and the steep challenges to implementing them.

The goal of the Paris Climate Accord is to limit global warming to 2 degrees Celsius, the point beyond which the impacts of climate change are feared to be most severe and enduring. Staying below the 2-degree limit will require two complementary strategies. The first, mitigation, is now familiar and involves limiting carbon dioxide emissions today by turning to cleaner energy and greater energy efficiency.

The second strategy, negative emissions, is equally important in limiting future climate impacts yet has received much less attention in public dialogue and policy circles. Technologies don't yet exist in any practical sense, yet they will be counted upon to remove decades worth of carbon dioxide emissions from Earth's atmosphere by the end of this century.

At their best, new negative emissions tools will play a vital role in holding climate change in check. But this may also give us a false sense of security that today's carbon emissions can be reversed at some point in the future.

AXIOS

The *Energy Policy Now* podcast with Glen Peters is “worthy of your time,” says Ben Geman of Axios. “The podcast is a lucid look at the potential for technologies such as direct air capture and afforestation, but also enormous challenges—around land use, ethics, cost and more—facing deployment.”

“Essentially, we need to build a [negative emissions] industry three to four times the current oil and gas industry—just to clean up our waste.”

—GLEN PETERS

PODCAST

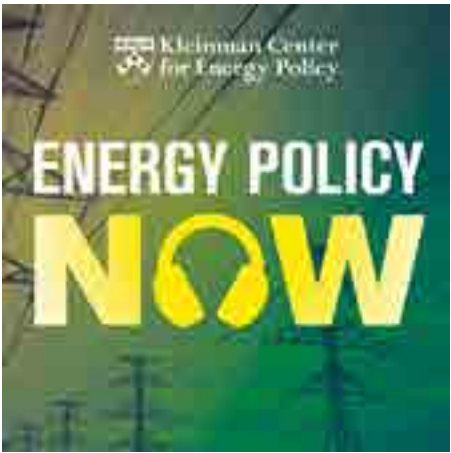
PRODUCER & HOST

Andy Stone,
Energy Policy Now



In its third season, the *Energy Policy Now* podcast offers clear talk on the policy issues that define our relationship to energy and its impact on society and the environment.

Former *Forbes* journalist Andy Stone is producer and host of the bi-weekly series. Since January 2017, he has conversed with more than 60 leaders from industry, government, and academia—shedding light on today’s pressing energy policy debates.



WHAT OUR ITUNES FANS ARE SAYING

- “This is a fantastic podcast. Host Andy Stone is an agile, knowledgeable interviewer, and his guests include an array of well-placed sources plugged-in to the energy and environment scene.”
- “Energy policy affects all of us, more than ever. If you want to better understand today’s world (and tomorrow’s), here’s your podcast! Please keep them coming!”
- “Love host Andy Stone’s ability to hone-in on key policy issues. He takes big, abstract energy topics and boils them down into meaningful, timely, and relevant conversations.”
- “Great podcast on energy issues that I’ve heard lots of talk about but hadn’t had the opportunity to actually understand. The podcast was both clear and pretty sophisticated, and a great help. I’m really glad I found this.”
- “Fantastic, insightful content. Well done.”

THIS YEAR’S EPISODES

Ending Water Wars

Scott Moore, *Kleinman Center and Penn Global China Program*

U.S. Offshore Wind Industry Arrives

Brandon Burke, *Kleinman Center*
Jim Bennett, *Bureau of Ocean Energy Management*

Handicapping EPA’s Deregulatory Climate Agenda

Joseph Goffman, *Environmental Law Program at Harvard University*

Decision-Making for Climate Leaders

Mark Alan Hughes, *Kleinman Center*

Grid Resilience in the Cyber Age

Gladys Brown, *Pennsylvania Public Utility Commission*

Gas Pipelines: A Threat to Electric Grid Resilience?

William Hederman, *Kleinman Center*

What IPCC 1.5 Degree Report Means for Global Climate Action

Oliver Geden, *German Institute for International and Security Affairs*

The Battle Over Methane Leaks

Catherine Hausman, *School of Public Policy at the University of Michigan*
Ben Ratner, *Environmental Defense Fund*

As India Eliminates Energy Poverty, Can It Also Fight Climate Change?

Piyush Goyal, *Government of India*

Vox’s David Roberts on Energy, Climate, and the Media

David Roberts, *Kleinman Center*

Bold Climate Policy Is Coming. Investors, Take Note.

Nathan Fabian, *Principles for Responsible Investment*

Welcome to the Anthropocene, Our New Biogeophysical Home

Will Steffen, *Australian National University*

Where Does the Defense Department Really Stand on Climate?

Mark Nevitt, *Penn Law*

China’s EV Juggernaut

John Paul MacDuffie, *Wharton*

Getting to the Right Carbon Price

Dallas Burtraw, *Resources for the Future*

Can Norway’s State Oil Company Be a Climate Champion?

Stephen Bull, *Equinor*

200 Years of Energy History in 30 Minutes

Jesús Fernández-Villaverde, *School of Arts and Sciences*

A Hard Look at Negative Emissions

Glen Peters, *Center for International Climate Research (CICERO)*

An Inside Look at the U.N.’s Effort to End Energy Poverty

Rachel Kyte, *Sustainable Energy for All (SEforALL)*

What’s the FERC, and How Is It Shaping Our Energy Future? (Part 1)

Colette Honorable, *FERC (formerly)*

What’s the FERC, and How Is It Shaping Our Energy Future? (Part 2)

Colette Honorable, *FERC (formerly)*

Why Coal Persists

Anna Mikulska, *Kleinman Center*

Three Pathways to Uphold America’s Paris Commitment

Matthew Binsted, *Pacific Northwest National*
Brad Townsend, *Center for Climate and Energy Solutions*

Does Attribution Science Give Climate Litigators a Smoking Gun?

Peter Frumhoff, *Union of Concerned Scientists*
Michael Burger, *Sabin Center for Climate Change Law at Columbia University*



FEATURED BLOG POST

RETREAT? NOT JUST A DEVELOPING WORLD PROBLEM

AUTHOR

Cornelia Colijn, *Executive Director,
Kleinman Center*



For centuries, the Dutch have been contending with water. Today, 26% of land in the Netherlands is below sea level, with another 50% of total land mass reaching heights of less than 1 meter. It's a Herculean effort to keep land previously reclaimed from the sea dry. An impressive 20,000-kilometer network of dikes combine with dams, levees, locks, sluices, and floodgates to prevent river flooding and storm surges from wiping out key economic and cultural hubs.

The Dutch are, for good reason, revered as the gold standard when it comes to water management.

The Delta Works, Room for the River projects, the Rijkswaterstaat, and district water boards all constitute engineering and management feats that have by-and-large protected the Netherlands from the deleterious effects having too much water and being too close to sea level. Add in the fact that Dutch children are taught to swim in pools with all their clothing on. And their shoes. You know, just in case. They seem to have thought of everything.

But future climate change may cause radical shifts in the Dutch ethos.

A new story by Vrij Nederland sheds light on the 2019 Delta Programme Report, released in September, which supplements research under way at several Dutch universities, including Delft University of Technology. An appendix to the report points to accelerated climate related sea level rise. It warns that if global warming under the Paris Agreement is limited to a maximum of 2 degrees Celsius by 2050, the Dutch coast will still experience between a 1-2 meter rise. In summary, projections suggest the Dutch delta will be habitable until 2050 under this scenario. And then, uncertainty reigns.

Now, if global warming exceeds 2 degrees Celsius (Climate Action Tracker suggests 3.3 degrees), models predict that sea level rise in the Netherlands may exceed 3 meters by 2100. Under this scenario it becomes virtually impossible to keep the water out. Huge sand replenishment projects (25 times the current effort) would work around the clock. Dikes would be built higher and higher. Enormous pumping stations would transport river water up over the barriers and out to sea. Freshwater intrusion would become rampant. The country's €90 billion agriculture export economy would fracture.

Inconsistent with this possible future, the Netherlands is not currently on track to meet its Paris commitments. Though a recent Dutch appeals court ruling might change all that, the fact remains that in nearly three decades the country has so far only cut emissions by 13%. Essentially, nothing on the emissions needle has moved since 2012.

Where does this leave the Netherlands today?

There are several proposals underway, originally envisioned by Deltares two years ago:

Fort. Significant public monies would be invested in building fortification from the sea and river deltas along with massive-scale pumping stations to move water over the large dikes and into the sea. This is both costly and energy intensive, and frankly, not great for the environment.

Stilts. Moving cities across the Randstad and IJsselmeer onto stilts would require design implementation yet to be realized on this scale anywhere on earth. The value lies in letting rivers run naturally and freely, accommodating sea level rise, flooding, and natural siltation. The consequence is abandoning some of the country's most prolific agricultural zones.

Islands. The island plan would give some land back to the sea, but preserve high value areas. The not insignificant cost comes from fortifying these islands against inevitably

rising tides and storm surges, similar to any coast. Additionally, this proposal requires maintained connectivity between these islands and the mainland.

Retreat. The most controversial plan of all gives reclaimed polders back to the sea, allows rivers to flow freely, and abandons—well, everything—for a planned move to the east. Because the Netherlands is densely packed, relocating populations within current borders is unlikely. So, there are (half joking) suggestions for “compulsory German language instruction for school-age children.”

If climate change doesn't get the attention of a Dutch man or woman, watching the Netherlands fall into the sea from the German coast sure will. The idea is radical, and evokes anger and nationalism. Will huge swaths of the Netherlands secede to the Germans? Eighty years ago, this would have seemed absurd, but tomorrow this may seem like an okay deal to trade cultural heritage for survival.

The Netherlands faces some big choices. Fortunately, it has some resources. For people in developing countries combatting coastal sea level, retreat is often the only answer. But surprisingly, even in some forward-looking developed countries, managing relocation, starting with smart planning and investment decisions today, may be the ultimate answer.

“The Netherlands faces some big choices. Fortunately, it has some resources. For people in developing countries combating coastal sea level, retreat is often the only answer.”

—CORNELIA COLIJN

BLOG HIGHLIGHTS

Our blog showcases a variety of voices from our home at the University of Pennsylvania—including faculty, students, staff, senior fellows, and visiting scholars.

This year, we published 64 blog posts on timely energy topics. On these pages, we feature a few of the year’s highlights.



Follow our blog:
kleinmanenergy.upenn.edu/blog



July 12
FERC’s Order Redesigning PJM’s Capacity Market

Christina Simeone, *Director of Policy and External Affairs, Kleinman Center*

FERC recently issued an order proposing significant changes to PJM’s capacity market with the goal of protecting markets from state subsidies, giving stakeholders just 90 days to weight in.



August 15
Beating the Authoritarian Playbook on Climate Change

Mark Alan Hughes, *Faculty Director, Kleinman Center*

What if President Trump embraced the climate crisis as a way to assert an authoritarian regime? Mark Alan Hughes envisions a scenario where energy independence and anti-immigration policies are pursued in the name of climate protection.



September 11
The Climate Under Kavanaugh

Mollie Simon, *Communications Coordinator, Kleinman Center*

How Judge Kavanaugh and Justice Kennedy differ on the Clean Power Plan.



October 8
On Climate, Forget 2 Degrees. Let’s Talk Net Zero

Andy Stone, *Energy Policy Now Producer & Host, Kleinman Center*

By emphasizing temperature goals, it’s relatively easy for nations to appear to be doing more to address climate change than they really are, and harder for the public to discern the shortfall.



November 2
EVs Mean Growth for These Businesses

Christina Simeone, *Director of Policy and External Affairs, Kleinman Center*

In October, cumulative sales of plug-in electric vehicles in the U.S. hit the one million mark. That is good for the environment, and these businesses, too!



January 23
The Case for Electrifying California’s Cars

Giridhar Sankar, *Master of Business Administration, Wharton*

Last semester, a team of Wharton MBA students competed in the University of Michigan Renewable Energy Case Competition where they made the case for electrifying California’s auto fleet.



February 12
Ecological Civilization and the Green New Deal: Our Last Shot

Oscar Serpell, *Research Associate, Kleinman Center*

Both China and the United States are fielding ambitious new sustainability plans. The planet’s climate future will be determined by whether or not they succeed.



March 25
Yamal LNG: Success Has Many Fathers, Indeed

Anna Mikulska, *Senior Fellow, Kleinman Center*

In Russia, Novatek’s success in liquid natural gas is tied to smart moves and serendipity.



April 26
Transforming PGW: A Sustainable Model for the Future

Mark Alan Hughes, *Faculty Director, Kleinman Center*

Hughes delivers testimony about the sustainability of Philadelphia Gas Works. Carbon neutrality would flip PGW from a dismal future liability to a competitive asset for at least the remainder of the 21st century.



May 7
The Kids Are Alright

Mollie Simon, *Communications Coordinator, Kleinman Center*

From Philadelphia to Europe, students are walking out of the classroom and into the streets to stress the urgent need for climate action.



June 26
After the Fire: Philadelphia’s Responsibility to the Bigger Picture

Mark Alan Hughes, *Faculty Director, Kleinman Center*

After the explosion and fire at the PES refinery, the City of Philadelphia should connect the dots among a range of related environmental issues, events, and crises and raise the visibility and influence of the City’s environmental policy makers.

FERC’s Order Redesigning PJM’s Capacity Market photo courtesy of tableatny, via Flickr.

Beating the Authoritarian Playbook on Climate Change photo courtesy of AP.

The Climate Under Kavanaugh photo courtesy of PolitiFact.

Ecological Civilization and the Green New Deal: Our Last Shot photo courtesy of Senate Democrats, via Flickr.

Yamal LNG: Success Has Many Fathers, Indeed photo courtesy of LNG World News.

Transforming PGW: A Sustainable Model for the Future photo courtesy of Wikimedia Commons.

After the Fire: Philadelphia’s Responsibility to the Bigger Picture photo courtesy of NBC News Philadelphia.



GRANTS

FEATURED FACULTY GRANT

FAILED CARBON TAX INITIATIVES

AUTHOR

Ioana Marinescu, *Assistant Professor, School of Social Policy and Practice*



Read the full digest:
[kleinmanenergy.upenn.edu/
policy-digests/its-ideology-stupid](http://kleinmanenergy.upenn.edu/policy-digests/its-ideology-stupid)

When Associate Professor Ioana Marinescu became interested in carbon tax policy, she knew that collaboration with others would be crucial.

“On the face of it, this research really isn’t my area,” she explained. “I’m a labor and public economist.” Which is why she reached out to an environmental economist and a state government political scientist.

In truth, however, the topic wasn’t so far afield from her work at Penn’s School of Social Policy and Practice—which is why it interested her. “I research labor markets and basic income. Carbon tax seemed related,” she said—like the “perfect marriage” of her past research on incentives, externalities, and revenue recycling schemes.

With Washington state’s recent failed carbon tax ballot initiatives, the landscape was ripe for research. Together with Soren Anderson, an associate professor in economics from Michigan State University and Boris Shor, an assistant professor in political science at the University of Houston, she designed a survey to measure public opinion. Not just in Washington, but across the nation, as a comparison.

The team found that the main predictor of voting was ideology: support for a carbon tax tends to be higher in more Democratic states. This means that a Washington-style carbon tax could potentially only pass in states with both Democratic majority and a popular initiative process (Massachusetts and California). This, of course, remains to be seen.

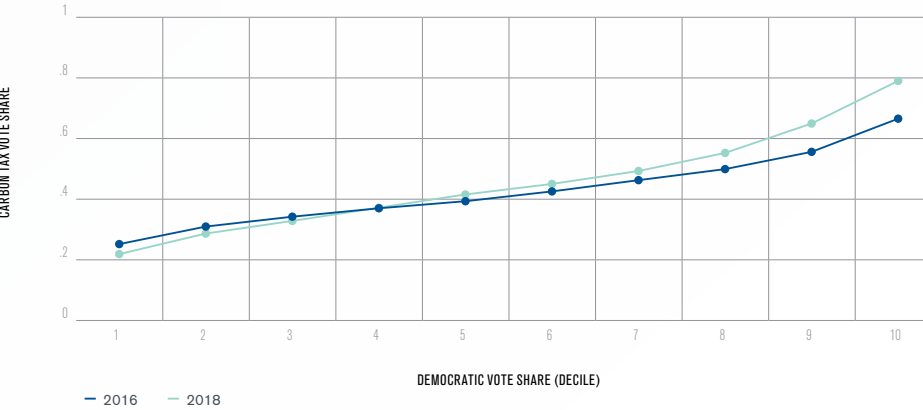
For Marinescu, the most surprising find from the survey, however, is that voters in other states reported higher support for the carbon tax than Washington.

If Washington state, with its Democrat majority, liked it enough to put in on the ballot (by popular initiative), how did it not pass in the end? And why, after the fact, did residents in other states report a 20% higher support of the carbon tax?

Marinescu’s team attributes this to the campaign effect. By listening to carbon tax campaign messaging, Marinescu explains, voters learn to either “hate it so much more, or like it so much less,” which matters at the polls.

“Twenty percent is eye-popping,” says Marinescu. “We can’t say what it was about the campaign. But we can say that the whole package affected voter behavior.”

If the campaign affect had this much pull in an ideologically supportive state like Washington, it seems that the success of a state carbon tax elsewhere looks doubtful.



Note: This figure plots the “yes” shares on I-1631 in 2018 (solid line) and I-732 in 2016 (dashed line) by decile of the Democratic party vote share in the 2016 presidential election. Each decile contains precincts that together add up to a tenth of votes cast in 2016 and 2018 respectively. Deciles for 2018 are constructed from precinct-level data in the following way: sort precincts from the lowest to the highest Democratic vote share, and then determine decile cutoffs. Deciles for 2016 (dashed line) are constructed similarly. Thus, the overall vote share can be visualized as the average height of the points.

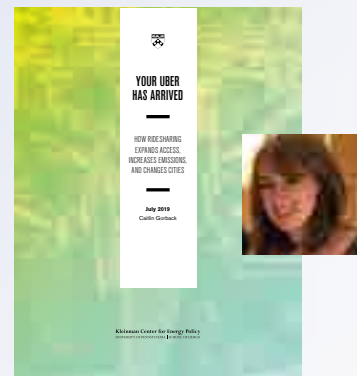
Source: State of Washington Secretary of State and U.S. Census.

By listening to carbon tax campaign messaging, Marinescu explains, voters learn to either “hate it so much more, or like it so much less,” which matters at the polls.



FEATURED PH.D. GRANTS

RIDE-HAIL
RESEARCH

**Your Uber Has Arrived:
How Ridesharing Expands
Access, Increases Emissions,
and Changes Cities**

Caitlin Gorback, *Doctoral Student,
Applied Economics, Wharton*

**Buy-Buy Bus: The Downside
of Ride-Hail in Philadelphia**

Xiaoxia “Summer” Dong,
*Doctoral Student, City and Regional
Planning, Stuart Weitzman
School of Design*

**Read these digests:**

[kleinmanenergy.upenn.edu/
policy-digests](http://kleinmanenergy.upenn.edu/policy-digests)

Two Ph.D. students and Kleinman Center grant recipients captured our attention this year with innovative research into the effects of Uber and Lyft.

Two years ago, Wharton student Caitlin Gorback was planning to meet a friend at a bar. When she looked up the address, she was surprised to see it was rather far. Carless, she calculated that public transport would take her 45 minutes and would cost about \$5.

And then she considered Uber. She opened the app and saw the trip would cost \$6 and take her door-to-door in 15 minutes. With the push of a button, her Uber was on its way.

Similarly, design student Summer Dong recalls a recent Lyft trip to the Philadelphia airport.

“I was going to take Regional Rail on a weekday morning for \$10, but I was running a little late and the train station was a 15-minute walk from my apartment.” Dong decided to take a Lyft for nearly the same price. In two minutes, his driver was there, “like a private chauffeur.”

For Gorback and Dong, examining their own consumer behavior inspired deeper research questions.

Gorback wondered if Uber and Lyft were changing the makeup of cities. With more access, were businesses able to locate farther out? Yes, her New York City data proved. But it seems that this growth on the outskirts happens for amenities like restaurants; not for dry cleaners or other essential services.

Dong wondered what impact Uber and Lyft had on public transit’s decline. He designed a survey to explore the tipping point between using ride-hail versus public transit. Dong found that consumers were overall more likely to use ride-hail, more likely to use it for recreation and fun, and also lacked awareness or concern about its environmental impact.

Dong was fascinated by the momentum of Uber and Lyft. “I feel like I’m part of that momentum,” he said. “They have certainly changed my way of travel.”

“Uber and Lyft open up new areas of the city, leading to more urban exploration” said Gorback, who explained that some researchers in her area thought she would find concentration and not dispersion as a result of ride-hail.

Gorback’s model used public data from Google and the Environmental Protection Agency, and her Kleinman Center grant helped her gather that data. Gorback explained that Google allowed her to pull free data for a couple thousand trips, but she needed data for about 20 million trips. “While that data is available, it’s also expensive.”

The Kleinman Center grant “opened up a whole new world for me,” said Dong. “It’s really easy to get siloed in your own area as Ph.D. students. I wasn’t considering the energy and environmental impact. This grant transformed my research into something better—something more interdisciplinary.”

Dong plans to use remaining Kleinman Center funds to conduct a follow-up survey to learn more about consumer ride-hail decision-making.

Gorback, meanwhile, reminds us that research doesn’t happen in a vacuum. Networks like the Kleinman Center are important, she said. And connections with people also inspire unique research questions.

“An economist goes to a bar,” Gorback laughed, “and this is what happened.”

“It’s really easy to get
siloed in your own area
as Ph.D. students.
This grant transformed
my research into something
more interdisciplinary.”

—SUMMER DONG



FACULTY &
PH.D. GRANTS

Architecture and Energy
Transitions: The Case of the
Bauhaus Dessau Building

Author: Daniel Barber, *Associate Professor, Architecture, Stuart Weitzman School of Design*

How have energy transitions—including material, technological, and policy changes—impacted architectural ideas and projects? This study applies this question to the iconic Bauhaus Dessau building in Germany.

Endogenizing Fuel Price Risk
(and Uncertainty)

Author: Steven Kimbrough, *Professor, Operations, Information and Decisions, Wharton*

As the recent literature indicates, risk assessment in power systems is underdeveloped and there is no general agreement on how to do it. This research explores critical assessment of methods for measuring risk, as relevant to fuel price risk in electric power systems.

Energy Cost Burdens for
Low-Income Households

Author: Vincent Reina, *Assistant Professor, City and Regional Planning, Stuart Weitzman School of Design*

Co-Author: Constantine Kontokosta, *Assistant Professor, New York University*

How does energy efficiency and energy cost vary across demographic and income groups, neighborhoods, and regions? This study explores those variables and the implications of energy retrofits for renters and owners.

Fossil Fuels, the Building Industry,
and Human Health

Author: Franca Trubiano, *Associate Professor, Architecture, Stuart Weitzman School of Design*

This project reviews existing research focused on the health impact of fossil fuel polymer-based materials used in buildings. The author will also explore where fossil fuel polymer-based materials are most typically used and what alternatives are being developed.

Fracking and Indigenous Demands
in the South of Argentina

Author: Tulia Falleti, *Associate Professor, Political Science, School of Arts and Sciences*

This project explores the environmental conflicts surrounding extractive industries and indigenous demands, particularly as they pertain to the southern Argentine province of Neuquén, where indigenous communities are interacting with oil companies.

Jump-Starting the Market:
Subsidies and Firm Entry

Author: Felipe Flores-Golfin, *Doctoral Student, Business Economics and Public Policy, Wharton*

This study attempts to build a structural model of solar panel demand and supply that accounts for endogenous entry of solar installers. Using micro data on solar installations, the author will estimate the effect of subsidies on solar adoption.

Migration, Climate Change, and
Sustainability Attitudes

Author: Sabrina Arias, *Doctoral Student, International Relations, School of Arts and Sciences*

Co-Author: Christopher Blair, *Doctoral Student, International Relations, School of Arts and Sciences*

Little academic work has examined public perceptions of the causes and consequences of climate migration. This project seeks to redress the gap in the literature linking climate change and migration.

Power Issue of *Scenario Journal*

Author: Stephanie Carlisle, *Lecturer, Landscape Architecture, Stuart Weitzman School of Design*

Co-Author: Nicholas Pevzner, *Kleinman Center Faculty Fellow; Lecturer, Landscape Architecture, Stuart Weitzman School of Design*

This project dedicates a special issue of *Scenario Journal* to the topic of power. This focused edition features articles that delve into today's energy transition and its political and technological dimensions.

Repowering Ulaanbaatar:
Urbanization after Coal

Author: Stephanie Carlisle, *Lecturer, Landscape Architecture, Stuart Weitzman School of Design*

Co-Author: Nicholas Pevzner, *Kleinman Center Faculty Fellow; Lecturer, Landscape Architecture, Stuart Weitzman School of Design*

As air pollution in Ulaanbaatar, Mongolia becomes a major public health crisis, a change in energy supply seems inevitable. Envisioning what that transformation looks like is the goal of this research.

The Politics of Carbon Taxes
at the State Level

Author: Ioana Marinescu, *Assistant Professor, School of Social Policy and Practice*

What drives support for a carbon tax? This project looks at the Washington State carbon tax referendum through a nationally represented survey—delving into specific questions about what drives support of a carbon tax.

Uber and Lyft's Effects on Gasoline
Consumption and Emissions

Author: Xiaoxia “Summer” Dong, *Doctoral Student, City and Regional Planning, Stuart Weitzman School of Design*

What are the effects of transportation network companies (TNCs) like Uber and Lyft on travel behavior and the transportation system? And what are the implications for energy consumption and emissions? This research explores these issues in the Philadelphia region.

Your Uber Has Arrived:
Ridesharing and Emissions Impacts

Author: Caitlin Gorback, *Doctoral Student, Real Estate, Wharton*

When Uber enters a city, far-flung areas become more accessible—implying an increase in Uber trips and emissions. This project tests this growth of emissions and several policy interventions that might affect the flow of ridesharing.



FEATURED STUDENT GRANT

IEA FELLOWSHIP: TAKING ENERGY EDUCATION GLOBAL

STUDENT

Mary Lim, 2019 Kleinman Birol Fellow



When Mary Lim began her MBA at Wharton, she knew she wanted global experience. And her summer as the Kleinman Birol Fellow at the International Energy Agency (IEA) in Paris, France not only gave her that—it thrust her into a timely research topic.

PREPARING FOR COP

In November, Chile will host the 25th Conference of Parties (COP), an international meeting of members of the United Nations to assess progress in dealing with climate change. Because of this upcoming milestone, Chile has been ramping up their national efforts around climate change and renewable energies.

In preparation for COP, Lim had the opportunity to work with IEA's environment and climate change team on a project focused on Chile's climate commitments.

Lim looked closely at Chile's policies, specifically their National Determined Contribution under the Paris Agreement. She explored what they elected to contribute toward the Paris goals, if they are staying on track, and what they could be doing better.

FROM HERE TO THERE

“My two biggest goals coming into Wharton were getting more diverse industry experience and more international experience and this internship has kept me on that path,” said Lim.

During her undergraduate education, Lim studied international relations with a focus on energy and environment in different countries and their responses to climate change.

After completing her undergraduate degree at Georgetown University, she worked at KPMG with the power and utility team in Washington, D.C.

There she had utility clients and was able to get an understanding of energy from a business perspective. But when she came to Penn, she wanted to take a closer look at energy from the policy side. The Kleinman Birol Fellowship at the IEA perfectly fit her ambitions.

WHAT'S NEXT?

This fellowship has been a unique experience that has given Lim a good idea of what it means to work abroad and with people from diverse counties and backgrounds.

After graduation, she plans to go back into consulting, where she will be able to apply her professional background with her applied research and coursework from Penn.

“Energy touches
everyone no matter
where they are.”

—MARY LIM



STUDENT GRANTS

KLEINMAN BIROL FELLOWSHIP

International Energy Agency

Mary Lim, *Master of Business Administration and International Global Studies, Wharton and School of Arts and Sciences*

INTERNSHIPS

Environmental Protection Agency

Nicholas Zhu, *Environmental Studies, School of Arts and Sciences*

Philadelphia Energy Authority

Frances Kane, *Science, Technology, and Society; School of Arts and Sciences*

Nicole Leonard, *Master of City Planning, Stuart Weitzman School of Design*

Hayley McCurdy, *Master of Environmental Studies, School of Arts and Sciences*

World Medical Association

Folasade Lapite, *Health and Societies and Master of Bioethics, School of Arts and Sciences and Perelman*

RESEARCH PROJECTS

Aerate Cooling System

Connor Sendel, *Mechanical Engineering Operations and Entrepreneurship, School of Engineering and Applied Science and Wharton*

Data Visualization of How Smart Transit Can Contribute to the Clean Energy Future

Wenjun Gao, *Master of Urban Spatial Analytics, Stuart Weitzman School of Design*

Governance of Public–Private Collaborative Innovation in Offshore Wind Technologies in the UK

Brandon Nguyen, *Environmental Policy and Management and Political Science, Wharton and School of Arts and Sciences*

PENN UNDERGRADUATE MENTORING PROGRAM (PURM)

Understanding the Role of Archaea in Methanogenesis Across Anoxic Environments

Reeti Shah, *Chemical and Biomolecular Engineering, School of Engineering and Applied Science*

Advisor: Dipti Pitta, *Assistant Professor, Veterinary Medicine*



“During my internship with the Philadelphia Energy Authority, I learned that no barrier is unsurpassable. I was constantly engaged collaborating on innovative strategies to tackle obstacles and unleash solar growth in the Philadelphia market.”

—HAYLEY MCCURDY, MASTER OF ENVIRONMENTAL STUDIES, SCHOOL OF ARTS AND SCIENCES

“Interning at the Philadelphia Energy Authority exposed me to Philadelphia’s most environmentally progressive city officials and entrepreneurs, providing me with valuable experience working at the intersection of public and private sectors to advance sustainability and environmental equity in Philadelphia.”

— NICOLE LEONARD, MASTER OF CITY PLANNING, STUART WEITZMAN SCHOOL OF DESIGN

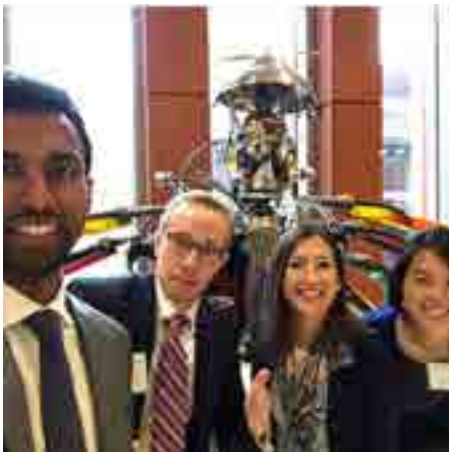
kleinmanenergy
Philadelphia City Hall



23 Likes

kleinmanenergy One of our spring interns, Nicole Leonard, worked for @philaenergy and helped with the Phase 3 launch of @solarizephilly, their residential solar program.

kleinmanenergy



8 Likes

kleinmanenergy Last semester, a team of Wharton School MBA students competed in the University of Michigan Renewable Energy Case Competition where they made the case for electrifying California’s auto fleet. This experience was made possible with a Kleinman Center grant. There is still time to apply for a Spring 2019 grant (deadline Friday!).

kleinmanenergy
Washington, D.C.



9 Likes

kleinmanenergy This week, student grant recipient Nicholas Zhu began his internship at the U.S. Environmental Protection Agency Headquarters in D.C. He will be working for the Resources Management Division this summer.

Learn more about our student grant program: <https://kleinmanenergy.upenn.edu/student-grants>

kleinmanenergy



20 Likes

kleinmanenergy Mahvish Ilyas has been interning with the Philadelphia Energy Authority and working with #SolarizePHL. She was recently recognized by Philadelphia City Council and featured in a Grid Magazine.

kleinmanenergy



14 Likes

kleinmanenergy With support from the KCEP, Sid Radhakrishna, a 1st year MBA at The Wharton School attended the Industry Growth Forum hosted by National Renewable Energy Laboratory.

There, he met with leading investors and entrepreneurs to get their perspectives on how to catalyze funding and scaling of cleantech innovations. These included several University of Pennsylvania alums who are leaders in their field. Abe Yokell (C’03) of Congruent Ventures, Jonathan Glass (WG’98) of National Grid Partners, and Fred Chang (WG’97) of Qomo Capital & the China Cleantech Collaboratory.

#NREL #CleanTech #Innovation #Finance

kleinmanenergy



16 Likes

kleinmanenergy With support from KCEP, @Penn and @Wharton students got to meet @JigarShahDC and visit @GenerateCapital as part of the Wharton Energy Club’s #SFCleantechtrek



CONFERENCES, COMPETITIONS, AND EVENTS

NREL Emerging Markets Day & Industry Growth Forum

Sid Radhakrishna, *Master of Business Administration, Wharton*

Penn Alumni in Cleantech Event

Raina Gandhi, *Master of Business Administration, Wharton*

Preserving Recent Past 3” Conference

Di Sung, *Dual Masters in Environmental Building Design and Historic Preservation, Stuart Weitzman School of Design*

Supramolecular Chemistry and Self-Assembly over Multiple Scales and Forms Conference

Katherine Elbert, *Master of Chemical Sciences, School of Arts and Sciences*

Sustainable Solutions Competition

Richard Ling, *VIPER student, School of Engineering Applied Science and School of Arts and Sciences*

University of Michigan Renewable Energy Case Competition

Christina Chang, *Master of Business Administration, Wharton*

Alexander Dempsey, *Master of Business Administration, Wharton*

Laura Krivec, *Master of Business Administration, Wharton*

Giridhar Sankar, *Master of Business Administration, Wharton*

Wharton Latin American Conference

Arturo Chue, *Master of Business Administration, Wharton*

TRAVEL

Global Service–Learning Program: Argentina

Fahmida Lubna, *Chemical and Biomolecular Engineering, School of Engineering and Applied Science*

Global Service–Learning Program: Rwanda

Timaj Abdi, *Systems Engineering, School of Engineering and Applied Science*

Penn Summer Abroad in Berlin and Rotterdam

Kimberlie Dupiton, *Biology, School of Arts and Sciences*

Lonard Encarnacion, *Health and Societies, School of Arts and Sciences*

Trapetas McGill, *Political Science and Africana Studies, School of Arts and Sciences*

Joseph Squillaro, *Philosophy, Politics, and Economics, School of Arts and Sciences*

Brea Watkins, *Environmental Studies, School of Arts and Sciences*

Valuation of Electric Vehicles and Parking Policies in Philadelphia (travel research)

Anna Cheyette, *Environmental Studies, School of Arts and Sciences*

Wharton Undergraduate Energy Group Field Trip to PJM Headquarters

Andrew Langalis, *Chemical and Biomolecular Engineering, School of Engineering and Applied Science*

GREEN PROGRAM

The GREEN Program is an off-campus organization that helps support learning about sustainability out of the classroom and around the globe. This year, we helped support Penn students traveling with the GREEN Program to Iceland and Japan.

Iceland

Kailey Blair, *Materials Science and Engineering, School of Engineering and Applied Science*

Joshua Feig, *Materials Science and Engineering, School of Engineering and Applied Science*

Hae Min Kim, *Mechanical Engineering and Applied Mechanics, School of Engineering and Applied Science*

Japan

Anderson Myers, *Electrical Engineering, School of Engineering and Applied Science*



“I easily learned more in half a week on the Penn Berlin and Rotterdam program than my entire semester abroad. It was so jam packed with exclusive learning opportunities.”

—DAMIEN KOUSSIS, ECONOMICS, WHARTON



“The Kleinman Center is a tremendous asset at Penn. I’m so grateful for the numerous educational and professional opportunities that the center has provided me.”

—ANNA CHEYETTE, ENVIRONMENTAL STUDIES, SCHOOL OF ARTS AND SCIENCES



“What I liked especially about the GREEN program is that it allowed me to meet other college students from all around the nation from various backgrounds that all shared my interest in renewable energy. I can confidently say I came out of this brief yet impactful experience more mature and greatly more knowledgeable about the field of renewable energy.”

—MAHER ABDEL SAMAD, ECONOMICS, WHARTON

“The trip to PJM helped me gain more insight in the energy field and has encouraged me to learn more about it in the future. A trip like this helps a freshman like me become familiar with some basics of an energy company. It was interesting to learn the difference between capacity and reserves, as well as how different desks communicate with each other in the control center.”

—YIDE ZHAO, UNDECLARED, SCHOOL OF ARTS AND SCIENCES



CERTIFICATE PROGRAM

WHERE ARE THEY NOW

In 2015, the Kleinman Center began offering a Certificate in Energy Management and Policy—open to all interested Penn graduate students. Since then, 19 Penn students have entered the work force with this credential. Here's a look at the trajectory of a few of these graduates.



ROBERT RITCHIE

BUSINESS DEVELOPMENT MANAGER ENERGY STORAGE AT NEXAMP

Lead development of energy storage projects from initial project analysis through project development and financing

Focus Areas: energy storage, solar, project development, strategy, stakeholder engagement, partnerships, energy policy, engineering

“The certificate gave me the chance to explore my interests outside of engineering and broaden my knowledge of energy policy, energy markets, and energy economics. This cross-functional program helped prepare me to look at issues from differing angles when taking on the many challenges of the renewable energy industry.”



MIRIAM POSNER

DIRECTOR OF CORPORATE ENGAGEMENT ENVIRONMENTAL LEAGUE OF MASSACHUSETTS

Teach businesses to advocate for better environmental policy

Focus Areas: climate change, protecting land, water, and public health

“The certificate program exposed me to a cross-section of courses from different departments. Being able to think like an engineer, a lawyer, or a designer gives me an interdisciplinary perspective and helps me be nimble.”



YANN MANIBOG

DIRECTOR, FINANCE AND CORPORATE DEVELOPMENT LINCOLN CLEAN ENERGY, LLC

Buy, sell, finance, and develop solar projects

Focus Areas: mergers and acquisitions, tax equity financing

“I wanted to get my MBA in order to transition to a career in clean energy...I don't think I would have been able to rebrand myself as an energy professional without this certificate.”

2018–2019 GRADUATES

Our certificate program offers graduate students multidisciplinary course offerings across five different schools—including our own energy courses, like Introduction to Energy Policy (ENMG 502), taught last fall in the Kleinman Center classroom by Senior Fellows Bill Hederman and Anna Mikulska.



Learn more about our certificate program:
kleinmanenergy.upenn.edu/certificate



GREGORY ARPINO

Juris Doctor, Penn Law



WINSTON CHEN

Master of Business Administration, Wharton



ERIC GILROY

Master of Business Administration, Wharton



JONATHAN HESS

Juris Doctor, Penn Law



JULIE UFFORD KEENAHAN

Master of Business Administration, Wharton; Kleinman Center Research Assistant

EVENTS

FEATURED EVENT

ENERGY TRANSITIONS:
THE CRITICAL PATH

How do we provide access to sustainable energy for the billion or more people who still lack electricity? To address this challenging question, we invited the U.N.'s Rachel Kyte—who spoke to a Kleinman Center audience in April.

Rachel Kyte, representative to the United Nations and CEO of Sustainable Energy for All has an important message to share with the world—and it isn't just about energy and sustainability. It's about people and fairness.

"It seems ridiculous to me that in 2019, in a world with so many sophisticated solutions to so many problems, we can't find a way for almost three billion people to have access to a meal that's cooked with clean fuels," Kyte said.

Of those three billion people, the World Health Organization estimates that each year nearly four million people die from illnesses related to indoor air pollution caused by using kerosene and solid fuels like charcoal and dung in open fires. The people who do the cooking—mostly poor women in rural areas and their children—experience the greatest levels of exposure.

This is just one example of the critical issues that leaders must grapple with as the world attempts to decarbonize.

Kyte emphasized that leaders must walk "a critical path" of speeding up the transition to net-zero carbon economies while also meeting the needs of those in the world who have unreliable and unaffordable energy.

"Energy systems of the future will look nothing like the energy systems of the past."

—RACHEL KYTE



"We have the technology. . .
We have finance. . .
What we lack is political
leadership and courage."

—RACHEL KYTE, REPRESENTATIVE TO THE UNITED NATIONS,
AND CEO OF SUSTAINABLE ENERGY FOR ALL

OUR EVENTS

Lecture

September 18

EFFECTIVE CLIMATE ACTION:
THE CASE FOR GREENHOUSE GAS NEUTRALITY

SPEAKER

Oliver Geden, Kleinman Center Visiting Scholar; Head of the EU/Europe Research Division, German Institute for International and Security Affairs

MODERATOR

Mark Alan Hughes, Faculty Director, Kleinman Center for Energy Policy

Roundtable

September 26

CYBERSECURITY: THREATS, BEST PRACTICES, AND IMPROVING THE REGULATORY FRAMEWORK

FBI KEYNOTE ADDRESS: CYBER THREATS TO CRITICAL INFRASTRUCTURE

Cerena Coughlin, Special Agent, FBI

PANEL I: EMERGING INDUSTRY BEST PRACTICES ON CYBERSECURITY IN THE UTILITY (ELECTRIC AND GAS) INDUSTRY

PANELISTS

Erfan Ibrahim, Founder, The Bit Bazaar, LLC

Steve Kunsman, Director, Product Management & Applications, ABB Grid Automation

Joseph McClelland, Director, Office of Energy Infrastructure Security, FERC

Jonathon Monken, Senior Director of System Resilience, PJM

Maggy Powell, Senior Manager, Real Time Systems Security, Exelon

MODERATOR

William Hederman, Senior Fellow, Kleinman Center

PANEL II: IMPROVING THE REGULATORY FRAMEWORK FOR CYBERSECURITY IN THE UTILITY INDUSTRY

Richard Mroz, Former President, NJ BPU

David Ortiz, Acting Director, Office of Electric Reliability, FERC

Vinny Sakore, Chief Technology Officer, Net Diligence

Greg Witte, Senior Security Engineer, G2 (for NIST)

Vox reporter and Kleinman Center Senior Fellow Dave Roberts explains why we need to “electrify everything.”



Conversation

October 1

COMMUNICATING WITH INTENT:
WRITING ON SCIENCE AND POLITICS

SPEAKER

David Roberts, Kleinman Center Senior Fellow; Energy and Climate Writer, Vox

MODERATOR

Mark Alan Hughes, Faculty Director, Kleinman Center for Energy Policy

Lecture

October 2

ELECTRIFY (ALMOST) EVERYTHING!
TACKLING CLIMATE CHANGE WITH CLEAN ELECTRICITY

SPEAKER

David Roberts, Kleinman Center Senior Fellow; Energy & Climate Writer, Vox

MODERATOR

Mark Alan Hughes, Faculty Director, Kleinman Center for Energy Policy

Panel

October 17

REDUCING METHANE LEAKS: ACTIONS AND CHALLENGES

PANELISTS

Catherine Hausman, Kleinman Center Visiting Scholar; Assistant Professor, School of Public Policy, University of Michigan

Ben Ratner, Senior Director, Environmental Defense Fund

MODERATOR

Karen Goldberg, Vagelos Professor in Energy Research, Department of Chemistry, School of Arts and Sciences

Lecture & Award Ceremony

October 19

2018 CARNOT PRIZE

RECIPIENT

Piyush Goyal, Minister of Railways and Coal, Government of India

SPEAKER

William W. Burke-White, Richard Perry Professor and Inaugural Director, Perry World House

SPEAKER

Aaswath Raman, Assistant Professor, Electrical and Systems Engineering, School of Engineering and Applied Science

Note: The guest of honor could not attend this event. We held the event in his honor and scheduled a follow-up event in India—where we presented him with the prize.

Roundtable

November 29

GRID MODERNIZATION IN PJM STATES: ENABLING THE GRID, UTILITY, AND ‘PROSUMER’ OF THE FUTURE

PANEL I: EMERGING STATE (AND D.C.) GRID MODERNIZATION VISIONS & IMPLEMENTATION PLANS

Chairman Asim Haque, Public Utilities Commission of Ohio

Chairman Betty Ann Kane, Washington, D.C. Public Service Commission

Chairman Brien Sheahan, Illinois Commerce Commission

Chairman Jason M. Stanek, Maryland Public Service Commission

PANEL II: GRID MOD (UTILITY FACILITATION OF EMERGING PROSUMERS)

Scott Burger, Co-Author, MIT’s Utility of the Future study

Paul Centolella, President, Paul Centolella & Associates

Anne Pramaggiore, Senior Executive VP and CEO, Exelon Utilities

Sanem Sergici, Principal, The Brattle Group



Lecture and Award Ceremony

January 30
CARNOT PRIZE IN INDIA

RECIPIENT AND SPEAKER
Piyush Goyal, *Minister of Railways and Coal, Government of India*

SPEAKERS
Fatih Birol, *Executive Director, International Energy Agency*

Cornelia Colijn, *Executive Director, Kleinman Center for Energy Policy*

MODERATOR
Mark Alan Hughes, *Faculty Director, Kleinman Center for Energy Policy*

Lecture

February 5
ROBUST CARBON MARKETS: RETHINKING QUANTITIES AND PRICES

SPEAKER
Dallas Burtraw, *Kleinman Center Visiting Scholar; Darius Gaskins Senior Fellow, Resources for the Future*

MODERATOR
Mark Alan Hughes, *Faculty Director, Kleinman Center for Energy Policy*



Explore past and upcoming events:
kleinmanenergy.upenn.edu/events

Panel

March 21
EVOLVING PERSPECTIVES ON ENERGY STORAGE

SPEAKERS
Ravi Manghani, *Director of Energy Storage, Wood Mackenzie Power & Renewables*

Arjun Prasad Ramadevanahalli, *Associate, Morgan Lewis*

Paul Reed, *Director of Business Development & Account Management, Viridity Energy, Inc.*

MODERATOR
Arthur van Benthem, *Kleinman Center Faculty Fellow; Assistant Professor, Wharton*

Lecture

April 16
ENERGY TRANSITIONS: THE CRITICAL PATH

SPEAKER
Rachel Kyte, *CEO, Sustainable Energy for All (SEforALL)*

MODERATOR
Mark Alan Hughes, *Faculty Director, Kleinman Center for Energy Policy*

PARTNER EVENTS



Panel

September 26
THE ECONOMIC CASE FOR TACKLING CLIMATE CHANGE

SPEAKERS
Felipe Calderón, *Former President, Mexico*

Antonia Villarruel, *Margaret Bond Simon Dean of Nursing, Penn School of Nursing*

MODERATOR
Angela Pachon, *Research Director, Kleinman Center for Energy Policy*

This panel was part of the Penn in Latin America & the Caribbean Conference.

Panel

September 28
REBUILDING RESILIENT POWER IN PUERTO RICO

SPEAKERS
Nicholas Pevzner, *Kleinman Center Faculty Fellow; Lecturer in Landscape Architecture, Stuart Weitzman School of Design*

Yadiel Rivera-Diaz, *Senior Architectural Designer, Marvel Architects NY*

MODERATOR
Angela Pachon, *Research Director, Kleinman Center for Energy Policy*

This panel was part of the Penn in Latin America & the Caribbean Conference.

Panel

March 29
RENEWABLE POWER IN LATIN AMERICA AND THE CARIBBEAN

SPEAKERS
Roberto Colindres, *Co-Founder and CFO, Rio Energy*

Leonardo Moreno, *Senior Vice President, Corporate Strategy & Investment and CRO, AES*

Beatriz Orrantia, *Former VP Special Projects, Barrick Gold Corporation*

MODERATOR
Angela Pachon, *Research Director, Kleinman Center for Energy Policy*

This panel was part of the Wharton Latin American Conference.

Panel

June 27
THE FUTURE HEALTH OF GRADUATE EDUCATION IN ENERGY

SPEAKERS
Susannah Barsom, *Associate Director, Emmett Interdisciplinary Program in Environment and Resources, Stanford University*

Cornelia Colijn, *Executive Director, Kleinman Center for Energy Policy*

Paul Salvador, *Director, Energy Science, Technology, and Policy Program, Carnegie Mellon University*

Scott Williams, *Research and Education Coordinator, Wisconsin Energy Institute, University of Wisconsin–Madison*

MODERATOR
Oscar Serpell, *Research Associate, Kleinman Center for Energy Policy*

This panel was part of the Environmental Studies and Sciences Conference at the University of Central Florida.

ENERGY ECONOMICS & FINANCE SEMINAR

For a third year, Faculty Fellow Arthur van Benthem hosted his seminar series, convening scholars for rigorous discourse on energy economics and finance topics.

Arthur van Benthem, *Kleinman Center Faculty Fellow; Assistant Professor, Wharton*



October 17

Are Energy Executives Rewarded for Luck?

Catherine Hausman, *Assistant Professor, Gerald Ford School of Public Policy; Visiting Scholar, Kleinman Center for Energy Policy*

October 24

Moral Hazard, Wildfires, and the Economic Incidence of Natural Disasters

Judd Boomhower, *Assistant Professor, Department of Economics, UC San Diego*

November 7

Crude by Rail, Option Value, and Pipeline Investment

Thomas Covert, *Assistant Professor, Booth School of Business, University of Chicago*

November 14

The Real Effects of Local Government Financial Frictions

Aymeric Bellon, *Ph.D. Student,*

Finance, Wharton

December 5

Demanding Innovation: The Impact of Consumer Subsidies on Solar Panel Production Costs

Todd Gerarden, *Assistant Professor, SC Johnson School of Business, Cornell*

March 20

Abatement Strategies and the Cost of Environmental Regulation: Emission Standards on the European Car Market

Mathias Reynaert, *Assistant Professor, Toulouse School of Economics*

April 3

Formative Experiences and the Price of Gasoline

Chris Severen, *Economist, Federal Reserve Bank of Philadelphia*

April 17

Firm-Level Financial Resources and Environmental Spills

Tatyana Deryugina, *Assistant Professor, University of Illinois*

“The efforts you are undertaking at the Kleinman Center are producing broader, positive value for the rest of us around Penn.”

—CARY COGLIANESE, PENN LAW




SENIOR FELLOWS



KARL HAUSKER

Karl Hausker is a senior fellow in the Climate Program at the World Resources Institute. His research interests center around deep decarbonization.

HIGHLIGHTS




PODCAST

Betting on Climate Solutions



POLICY DIGEST

Are 100% Renewable Energy Targets Reasonable?



WILLIAM HEDERMAN

William Hederman is independent senior adviser at Deloitte and Touche, LLP and Executive Adviser at Agile PQ, Inc. He was Senior Advisor to Secretary Ernest Moniz at the U.S. Department of Energy.

HIGHLIGHTS




CLASS

Introduction to Energy Policy



PANEL

Cybersecurity: Foreign Powers & U.S. Vulnerability



PODCAST

Gas Pipelines: A Threat to Electric Grid Resilience?



KENNETH KULAK

Ken Kulak is a partner at the law firm of Morgan Lewis where he advises clients on energy regulation and complex energy transactions. His clients include utilities, developers, investors, and cooperate energy users.

HIGHLIGHTS




CLASS

Energy Law and Climate Change



EVENT


Evolving Perspectives on Energy Storage (adviser)



ANNA MIKULSKA


Anna Mikulska is a nonresident scholar in energy studies and Rice University's Baker Institute. Her research interests center around European energy markets and energy policy.

HIGHLIGHTS




CLASS

Introduction to Energy Policy




PODCAST

Why Coal Persists



POLICY DIGEST


The Long Goodbye: Why Some Nations Can't Kick the Coal Habit



SCOTT MOORE


Scott Moore is the director of the Penn Global China Program. He is a political scientist whose research focuses on environmental politics and policy reform, especially climate change, water resources, and ocean issues.

HIGHLIGHTS



EVENT

Water @ Wilson: 50 Years of Water, Conflict, and Cooperation



PODCAST

Ending Water Wars




For full bios, visit:
kleinmanenergy.upenn.edu/fellows



DAVID ROBERTS


David Roberts is an energy writer at *Vox*, where he covers climate change, clean energy, and politics. Prior to *Vox*, Roberts was an energy and climate writer at *Grist*.

HIGHLIGHTS




EVENT

Electrify (Almost) Everything!
Tackling Climate Change with Clean Electricity



PODCAST

Vox's David Roberts on Energy, Climate, and the Media



POLICY DIGEST


Superblocks: Barcelona's Plan to Free Itself from Cars



STEVE VISCELLI


Steve Viscelli is a lecturer in the Department of Sociology. His research focuses on work, labor market economics, and economic regulation. He is currently working to improve fuel efficiency in the trucking industry.

HIGHLIGHTS



BLOG POST

Climate Policy Won't Work Without Considering Labor



EVENT

Moving America Forward Conference



MICHAEL LEVY

Michael Levy is an associate professor of epidemiology at the Perelman School of Medicine. He works at the interface of epidemiology, climate change, and statistics to prevent the transmission of infectious diseases in changing environments.

HIGHLIGHTS



SEMINAR SESSION

Student Energy Policy Session at the Kleinman Center


FACULTY FELLOWS



ARTHUR VAN BENTHEM


Arthur van Benthem is a professor of business economics and public policy at Wharton. Before his doctoral studies he worked as an energy economist at Royal Dutch Shell.

HIGHLIGHTS




LECTURE

Biosphere Summit: Politics, Policy, and the Environment



PODCAST

Lessons from a Decade of Cap and Trade



SEMINAR

Energy Economics and Finance Seminar



NICHOLAS PEVZNER

Nicholas Pevzner is a full-time lecturer in the Landscape Architecture Department at the Stuart Weitzman School of Design and co-editor-in-chief of *Scenario Journal*.

HIGHLIGHTS



PUBLICATION

Power Issue of *Scenario Journal*



VISITING SCHOLARS



DALLAS BURTRAW

Darius Gaskins Senior Fellow, Resources for the Future

Dallas Burtraw has worked to promote efficient control of air pollution and written extensively on electricity industry regulation and environmental outcomes. Burtraw’s current research includes analysis of the distributional and regional consequences of climate policy, the evolution of electricity markets including renewable integration, and the interaction of climate policy with electricity markets. He has provided technical support in the design of carbon dioxide emissions trading programs in the Northeast states, California, and the European Union. He also has studied regulation of nitrogen oxides and sulfur dioxide under the Clean Air Act and conducted integrated assessment of costs, and modeled health and ecosystem effects and valuation, including ecosystem improvement in the Adirondack Park and the southern Appalachian region. Burtraw currently serves as the chair of California’s Independent Emissions Market Advisory Committee.

Burtraw holds a Ph.D. in economics and a master’s degree in public policy from the University of Michigan and a bachelor’s degree from the University of California, Davis.

HIGHLIGHTS



PUBLIC LECTURE

Robust Carbon Markets:
Rethinking Quantities and Prices



PODCAST

Getting to the Right Carbon Price



OLIVER GEDEN

Head of Research Division EU/Europe, German Institute for International and Security Affairs (SWP)

Oliver Geden is head of the EU/Europe Research Division at the German Institute for International and Security Affairs (SWP) in Berlin, which advises both the German Parliament and the German Federal Government. His work focuses on the European Union’s climate and energy policy, climate engineering, and the quality of scientific policy advice. He has been a visiting scholar at the University of California, Berkeley, and the Swiss Federal Institute of Technology (ETH), Zurich. During his time at SWP, he has been seconded to the Federal Foreign Office’s (AA) policy planning unit, and to the policy planning division of the Federal Ministry for Economic Affairs and Energy (BMWi).

Geden studied anthropology, gender studies, and political science, and received a Ph.D. in social and cultural anthropology at Humboldt University Berlin.

HIGHLIGHTS



POLICY DIGEST

Targeting Net Zero Emissions:
A New Focus for a More Effective Climate



PUBLIC LECTURE

Effective Climate Action:
The Case for Greenhouse Gas Neutrality



PODCAST

What IPCC 1.5 Degree Report
Means for Global Climate Action



Far Left: “Chalkboard thinking doesn’t always carry over into the real world.... Every pricing policy has been preceded by others,” said Dallas Burtraw in his Kleinman Center lecture.

Left: “Real-world policymaking is not primarily concerned about solving problems but dealing with problems,” said Oliver Geden.



CATHERINE HAUSMAN

Assistant Professor, Gerald Ford School of Public Policy, University of Michigan

Catherine H. Hausman is an assistant professor in the School of Public Policy at the University of Michigan and a faculty research fellow at the National Bureau of Economics Research. Her work focuses on environmental and energy economics. Her research has appeared in the *American Economic Journal: Applied Economics*, the *American Economic Journal: Economic Policy*, and the *Brookings Papers on Economic Activity*. Recent projects have looked at the economic and environmental impacts of shale gas; the market impacts of nuclear power plant closures; and the effects of electricity market deregulation on nuclear power safety. Prior to her graduate studies, Hausman studied in Peru under a Fulbright grant. She has taught statistics, a policy seminar on energy and the environment, and a course on government regulation of industry and the environment.

She holds a B.A. from the University of Minnesota and a Ph.D. in agricultural and resource economics from the University of California, Berkeley.

HIGHLIGHTS



POLICY DIGEST

Plugging the Leaks: Why Existing Financial
Incentives Aren’t Enough to Reduce Methane



PUBLIC LECTURE

Reducing Methane Leaks:
Actions and Challenges



PODCAST

The Battle Over Methane Leaks



SEMINAR SESSION

Energy Economics
& Finance Seminar



MARK TEMPLETON

Clinical Professor of Law, Director of the Abrams Environmental Law Clinic, University of Chicago

Mark N. Templeton is a clinical professor of Law, director of the Abrams Environmental Law Clinic at the University of Chicago Law School, and research affiliate of the Energy Policy Institute at Chicago.

Previously, Templeton was a trustee and executive director of the Office of Independent Trustees for the \$20 billion Deepwater Horizon Oil Spill Trust. He served as the cabinet-level director of the Missouri Department of Natural Resources, leading the state’s efforts in energy, environmental protection

From 2005 to 2009, Templeton served as associate dean and COO at Yale Law School. From 2001 to 2005, he developed environmental and sustainability strategies at McKinsey & Company, among other projects. Prior to joining McKinsey, Templeton was special assistant and senior adviser to the U.S. Assistant Secretary of State for Democracy, Human Rights and Labor and an adviser to the U.S. Delegation to the U.N. Commission on Human Rights. He was a financial analyst at Goldman Sachs from 1994 to 1996.

Templeton earned an A.B., magna cum laude, in social studies from Harvard College and a J.D. from Yale Law School.

HIGHLIGHTS



LECTURE

Environmental Management, Law, and Policy

Right: “Methane contributes about 16 percent of greenhouse gas emissions,” explained Catherine Hausman to an audience of students and faculty, “and is substantially more potent than CO₂.”

Far Right: Mark Templeton with Sarah Light, associate professor of legal studies and business ethics.



ADVISORY BOARD



For full bios, visit:
[kleinmanenergy.upenn.edu/
advisory-board](http://kleinmanenergy.upenn.edu/advisory-board)



PAUL BONNEY

Paul Bonney is the former senior vice president of legal and regulatory strategy for Pepco Holdings at Exelon Corporation.



MARK BROWNSTEIN

Mark Brownstein is the vice president and chief counsel of the U.S. Climate and Energy Program at the Environmental Defense Fund.



EMILY DUNCAN

Emily Duncan is a director of federal relations at National Grid, an electric and natural gas transmission and distribution utility.



SCOTT KLEINMAN

Scott Kleinman is co-president and lead partner at Apollo and founder of the Kleinman Center for Energy Policy.



SONNY POPOWSKY

Sonny Popowsky served for more than two decades as the consumer advocate of Pennsylvania.



JOHN QUIGLEY

John Quigley is the founding director of the Center for Environment, Energy & Economy and Lecturer at the Harrisburg University of Science and Technology and former secretary of the Pennsylvania Department of Environmental Protection.



LYNN SCARLETT

Lynn Scarlett is vice president for policy and government relations at The Nature Conservancy and former deputy secretary of the U.S. Department of the Interior.



MARVIN SCHLANGER

Marvin Schlanger is the former chairman of the supervisory board of LyondellBasell Industries N.V.



FREDERICK STEINER

Frederick Steiner is dean and Paley Professor of the Stuart Weitzman School of Design at the University of Pennsylvania.

STAFF



WILLIAM COHEN

Center Coordinator

Bill oversees office needs, supervises public events, tracks our budget, and provides technical support across many platforms. When possible, he dives into design and research projects.



OSCAR SERPELL

Research Associate

Oscar is a researcher, writer, and data analyst. He is part of several key research projects and also writes blog posts and policy digests on timely energy policy topics.



CORNELIA COLIJN

Executive Director

Cornelia envisions, plans, and manages all center programming, while building connections with students, faculty, and leaders in the energy industry.



CHRISTINA SIMEONE

Director of Policy and External Affairs

Christina interfaces with industry leaders to develop content and projects that are impactful and relevant. She is the author of many papers, digests, and blog posts.



MARK ALAN HUGHES

Faculty Director

Mark provides the vision and direction for all center activities while also leading several major research projects, including Decision-Making Under Deep Uncertainty.



MOLLIE SIMON

Communications Coordinator

Mollie supports all digital and print communications, manages the center's social media accounts, and drafts newsletters and announcements. She also writes and publishes content for our website, and regularly posts to our blog.



ANGELA PACHON

Research Director

Angela manages our research grants, visiting scholar program, and leadership series events while she develops scholarship and research collaborations across campus and beyond. She is also the author of many policy digests.



KIMBERLE SZCZUROWSKI

Administrative Assistant

Kim oversees scheduling, budgeting, event planning, and officer administration. She also helps manage our active student grants program.



LINDSEY SAMAHON

Director of Communications

Lindsey manages all things communications. She helps direct the voice of the center, manages all digital and print media, prepares content for publication, and serves as press contact.



ABOUT

MISSION

The Kleinman Center creates the conditions for policy innovation that support a just and efficient transition to sustainable energy.

VISION

Our vision is an energy system that optimizes productivity through smart demand, sustainable supply, and compensated externalities.

APPROACH

The Kleinman Center focuses on projects that:

- **Foster thoughtful and impactful energy research.**
We support Penn research through a variety of programs and bring distinguished energy leaders and scholars to Penn for visits and residencies.
- **Develop the next generation of energy leaders.**
We engage student learners by providing energy-related courses, a certificate program, lectures, internships, and grants for research and professional development.
- **Create conditions for stakeholders to explore options and develop agendas.**
We convene thought leaders with diverse interests in settings that foster productive conversations and action.

HISTORY

The Kleinman Center for Energy Policy was established in 2014, with a generous term gift from Scott (C'94, W'94) and Wendy Kleinman. The center continues its work thanks to additional donor generosity, including this year's anonymous \$30-million gift.

“The center. .is quickly developing an international reputation as an ideas leader in energy policy.”

—GREATER PHILADELPHIA CHAPTER OF THE ASSOCIATION OF ENERGY ENGINEERS

“Outstanding faculty enable Penn to drive energy solutions. In addition to supporting innovative programming, this gift will enable Penn to hire new faculty who specialize in energy policy. Through their scholarship, these faculty will influence today’s critical energy policy decisions. Through their teaching, they will help develop tomorrow’s energy policy leaders.”

—PENN PRESIDENT AMY GUTMANN, REGARDING THE CENTER'S \$30M GIFT



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